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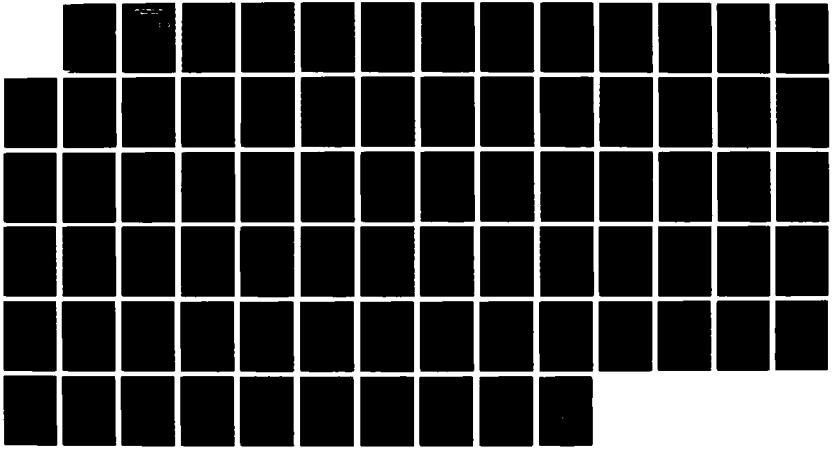

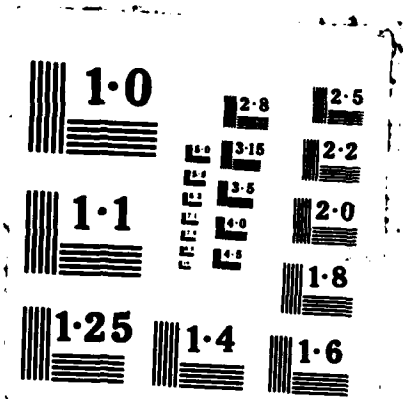
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NAVAL POSTGRADUATE SCHOOL
Monterey, California

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REGIONAL EMPLOYMENT GROWTH
AND
DEFENSE SPENDING

by

David C. Bruner

December 1987

Co-Advisor Loren M. Solnick
Co-Advisor Stephen L. Mehay

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The purpose of this thesis is to study how a state's growth or decline in employment is related to Department of Defense expenditures in that state. This analysis looks not only at the impact of total DOD expenditures on employment, but explores the effects of various categories of defense outlays such as military and civilian pay. Prime contract awards for procurement, services, research and development, and construction were included as well. The scope of the thesis was also broadened by considering the impact of defense spending on employment in various industries (i.e., manufacturing, services, and wholesale and retail trade) as well as on total employment. The analysis was conducted by regressing an econometric model using as input cross-sectional data (from the 48 contiguous states). The results indicated that defense spending is an important part of regional growth.

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Regional Employment Growth and Defense Spending

by

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Lieutenant, Civil Engineer Corp, United States Navy
B.S., Tennessee Technological University, 1982

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requirements for the degree of

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The purpose of this thesis is to study how a state's growth or decline in employment is related to Department of Defense expenditures in that state. This analysis looks not only at the impact of total DOD expenditures on employment, but explores the effects of various categories of defense outlays such as military and civilian pay. Prime contract awards for procurement, services, research and development, and construction were included as well. The scope of the thesis was also broadened by considering the impact of defense spending on employment in various industries (i.e., manufacturing, services, and wholesale and retail trade) as well as on total employment. The analysis was conducted by regressing an econometric model using as input cross-sectional data (from the 48 contiguous states). The results indicated that defense spending is an important part of regional growth.

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I. INTRODUCTION

A. OBJECTIVE

The purpose of this thesis is to study how a state's growth or decline in employment is related to Department of Defense (DOD) expenditures in that state. In other words, does increased spending on defense-related items within a state have a significant impact on employment growth? To answer this question an econometric model will be developed to determine whether or not statistically significant relationships exist between employment in various industries, such as manufacturing and services, and defense expenditures. Defense expenditures will be subdivided into components such as military and civilian pay, and prime contract awards for supplies, services, research and development, and construction. This will enable the researcher to determine what particular areas of defense outlays create the greatest benefit for a state in terms of employment growth.

B. BACKGROUND

Since World War II, military spending has played a critical role in the economy of the United States. Politicians and economists alike began to look at defense spending as a way to stimulate the national economy. More spending for military hardware meant more jobs and lower unemployment, which in the final analysis translated into votes. Perhaps that is what Ronald Reagan had in the back of his mind when he started his large build-up of the armed forces in 1980. His time in office saw defense spending as a share of GNP rise from a postwar low of 4.9 percent to 6.6 percent in 1987. This same period has been accompanied by strong, consistent economic growth and a lowering of unemployment levels. [Ref. 1: p. 1]

Is this a mere coincidence or has the pouring of money into defense been responsible for pulling the economy to higher ground? It is questions such as this that economists have been grappling with for years. While there is no doubt that military spending creates additional employment, many economists have stated that the economy would be better served if the county spent its dollars on other programs such as health care and education. This study hopes to be able to shed some light on these and other questions regarding the impact of defense spending on employment, particularly at the regional level.

C. RESEARCH QUESTION

The primary research question is concerned with determining how defense spending has affected employment in the 48 contiguous states during the period 1976-1985. The study will also seek to discover what basic industries (ie, manufacturing, wholesale and retail trade, and services) are most affected by this DOD spending on payrolls and prime contracts. These two components of defense spending will be further categorized into six subcomponents. Hopefully this will lead to a better understanding of how different areas of the DOD budget impact the employment levels within states. The six subcomponents will be:

(1) military pay
(2) civilian pay
(3) procurement contract awards
(4) service contract awards
(5) research and development contract awards, and
(6) construction contract awards

As a by-product of developing a valid econometric model, the impact of certain other factors will be explored. Specifically, the employment impact of state and local government spending for welfare and for health, education, and highways will be examined. Other factors to be included in the study will be "business climate" indicators and population variables.

D. SCOPE, LIMITATIONS, AND ASSUMPTIONS

This thesis will be based upon a multiple regression analysis of an econometric model, using as input cross-sectional (from the 48 contiguous states) data from the years 1976-1985, in hope that a relationship will be found linking employment growth to defense outlays within a state. To accurately model a state's economy with all the myriad of interrelated factors is beyond the scope of this study. The model as developed for this analysis is but a simple approximation of a real economy. Therefore, the results of the regression will have to be judiciously interpreted. For instance, a literal interpretation of the regression coefficients might lead one to conclude that increasing defense outlays within a state would create an additional 45,700 jobs. But, because of the approximate nature of the model, this conclusion is unjustified. Rather, the results will provide an insight as to the degree that defense spending influences state employment in comparison to the other factors, such as state spending for welfare.

One reason that a more accurate model cannot be developed is due to a lack of data. For instance, some research suggests that employment growth is affected by the cost of electricity within a state. However, attempts to locate the average electricity rates for the various states over the ten year period proved futile. Even the figures for defense spending in the various categories had to be interpolated for one year when they were not published.

As with most economic theories or models, assumptions must be made in order that the complexity of the problem not overwhelm the reseacher. This study is no exception. One of the key assumptions is that all prime contract dollars stay within the state in which the contract was awarded. Unfortunately, this assumption is often violated. Many large defense contractors have plants in several states which contribute to a single project. These plants will, of course, receive a portion of the award. Also, significant portions of many contracts are subcontracted out. Many of these subcontractors are located in other states. Regretably, there is no way to determine just what portion of each contract ends up in other states. While failing to account for this 'spreading out' of contract dollars does reduce the accuracy of the model, it should not prove critical; for the subcontract money leaving a state should be somewhat offset by the subcontract dollars entering the state.

Another assumption is that the employment impact of federal or state expenditures is immediate. For such items as military pay, this is true. Payroll expenditures are immediately translated into jobs. This is not neccessarily the case, however, when considering procurement contracts because the purchases are often spread out over several years after the contract is awarded.

The last assumption is that employment growth and population growth are closely related to each other. The implications of this interdependency are discussed in more detail in the following section.

E. METHODOLOGY

This thesis will use a pooled, cross-sectional, time-series (from 1976 to 1985) approach to examine the impact of defense expenditures on employment growth within the 48 contiguous states. By using such a rich data set, the researcher will be able to disentangle the separate effects of different categories of defense spending and public expenditures which a smaller data set would not allow.

The data will be gathered and then analyzed using a computer statistical package to perform a multiple linear regression on two equations simultaneously. The first

equation to be regressed will have population as the dependent variable. The second equation will use absolute empolyment level as the dependent variable. By solving the equations simultaneously, the interdependency between population and employment will be taken into account. Without this precaution, the results would be seriously flawed. The specific variables to be used in the model will be discussed in detail in a later chapter.

F. SUMMARY

The results of this study add support to the hypothesis that defense spending is an important aspect of regional employment growth. The results suggest that total defense expenditures do create employment gains in all industries but manufacturing. Certain components of defense spending proved to have a negative impact, however.

In general, the effects of the different types of defense expenditures varied widely. For instance, while procurement contract awards appeared to increase the number of jobs in the services sector, it reduced the quantity of jobs in manufacturing. Pay for military personnel had a positive impact on employment growth in both the manufacturing and service industries. Yet this same category of spending was deleterious to employment growth in the wholesale and retail trade sector. One area that bucked the trend was R&D. There the results were consistent--and negative for every industry.

G. ORGANIZATION

The following portions of this thesis are dedicated toward developing an understanding of the manner and magnitude which defense spending impacts the employment picture within a state. The second chapter briefly discusses the history of military spending in the United States and presents differing viewpoints regarding the benefits of this spending to the national economy. Chapter 3 then sets the stage for the model formulation by focusing on regional growth patterns and the theorized causes of this growth. Included in this section is an analysis of defense spending patterns and the dependency of states' economies on defense spending. The fourth chapter contains a description of the econometric model The rationale for determining each of the variables is discussed in detail, and the regression results are presented and analyzed. The final chapter contains a summary of the results and offers some final conclusions.

II. BENEFITS OF DEFENSE SPENDING

Prior to World War II, defense industries as we know them today were virtually nonexistent. In peacetime, industries directed their efforts toward the production of consumer goods. During wartime, business converted as rapidly as possible to production of armaments. And, when the war was over, the factories were reconverted to their normal civilian capacity.

Today, however, there are many industries which are solely or mostly engaged in the production of weapons of war. The reasons for this fundamental change are several. For one, there are the ever-increasing gaps between military and civilian technology and the specialized tooling required for the manufacturing of military arms. Earlier in our history civilian and military technology was fairly similar. A rifle used for hunting was similar to one used for killing the enemy. Thus, retooling was a fairly simple matter and, because it took so long for armies to mobilize and make major conquests, there was adequate time to retool.

The world became more complex after World War II. Rockets and planes could deliver super-destructive weapons, such as atom bombs, at barely a moments notice. There is no longer time to convert peacetime industries to defense needs. Wars can now be won or lost in days, as the Israelis so ably proved. Bigger and better weapons requiring ever more advanced technology also mandated that a sector of our economy be dedicated toward the production of military hardware. The good ole' days are gone. Defense industries and large defense procurement budgets are with us for good. [Ref. 2: p. 20]

Whether or not this is a wise policy has been the subject of numerous debates and studies. Since the 1950's, the conventional wisdom of policymakers has been that military expenditures promote economic stability and growth. This Keynesian macroeconomic philosophy infers that a high level of military spending leads to increased employment and economic prosperity. The wisdom of this theory seemed proven by World War II. Between 1939 and 1945 civilian employment grew 15 percent, military forces expanded from 370,000 to over 11 million, personal consumption rose 25 percent, and the GNP expanded rapidly. [Ref. 3: p. 2]

A report completed by the National Security Council in 1950 used to justify the 'cold war' military buildup offers clearer insight into this Keynesian policy. Mosley's synopsis of the report is as follows:

> The proponents of increased spending drew a number of conclusions about the economic implications of the military buildup: (1) there was significant unused capacity in the U.S. economy; (2) a further dynamic expansion of the economy might be achieved analogous to that in World War Two; (3) increased military expenditures are not a drag on the economy but may stimulate such an expansion; and (4) higher levels of military spending need not be at the expense of current living standards but are more than offset by the increment in GNP that they generate. [Ref. 3: p. 9]

Modern proponents of 'military Keynesianism' can also point to many examples where spending on defense has generated many jobs, both directly and indirectly. Any major proposed defense expenditure is sure to generate a host of reports from the potential contractor showing how the dollars spent on the program will add jobs directly and indirectly to the economy. The DOD is also quick to point out how defense dollars translate into jobs. The DOD's Office of Program Analysis and Evaluation estimates that for each additional one billion (1982) dollars spent on national defense, approximately 35,000 part-time and full-time jobs will be created. The DOD estimates that 25,000 of the jobs are due to the direct and indirect effects of defense spending. The other 10,000 jobs are due to the income multiplier and accelerator effects. [Ref. 4: p. 39]

The Bureau of Labor Statistics (BLS), in a separate analysis, estimates that each additional one billion dollars of defense spending creates 29,200 jobs, considering only the direct and indirect effects. If the multiplier effect is included, the number of jobs created rises to between 43,800 and 73,000. [Ref. 4: p. 41]

Both reports indicate that defense spending does create a significant number of jobs. This is not disputed. What many opponents of military spending do argue, however, is that spending on defense does not generate the economic and social benefits that would gave been generated had the money been spent in an alternative manner. One reason is that workers in defense-related industries are disproportionally highly skilled and educated and earn higher wages than the average worker. Consequently, a Federal program which directly or indirectly employs unskilled or semi-skilled workers is able to get more 'bang for the buck' and create more jobs than the DOD can, given equal dollars. [Ref. 5: p. 149]

A second factor which may reduce the employment-creation aspect of defense spending is the positive productivity differential between the capital-intensive defense industries and the average industrial rate. Because manpower productivity tends to be higher in defense industries, they employ fewer workers per contract dollar than non-defense industries. In addition, the DOD expects productivity growth in defense related industries will be 20 percent higher than productivity growth in the economy as a whole. This would only further reduce the job-creation potential of military spending. [Ref. 4: p. 46]

A study by Marion Anderson of Employment Research Associates adds weight to the premise than Pentagon spending is not as beneficial as the DOD would have one believe. Their shocking conclusion was that high levels of military spending create unemployment. By combining information of how a consumer responds to changes in income and the U.S. Bureau of Labor Statistics 156-industry imput-output model, the consulting firm determined that defense expenditures in 1981 generated 1,764,000 jobs. If consumers had been given this money through a tax cut, 3,284,000 jobs would have been created [Ref. 6: p. 12]. While this general thesis--that alternative civilian expenditures would create more employment opportunities than defense expenditures--is certainly feasible, the methodology and underlying assumptions of the study are suspect. Mosley, in particular, points out many shortcomings with the study, but nevertheless insists that the work provides valuable insight into the job opportunity costs of military spending [Ref. 3: p. 92].

In another major study, Roger Bezdek used a complex policy simulation model of the national economy to determine the effects of varying defense expenditures on the economy. He used the model, developed by the Department of Commerce, to simulate manpower effects of compensated shifts in defense spending. He used the model to analyze three hypothetical scenarios. First, he projected the 1980 U.S. economy based on annual defense spending increases of 2.5 percent from 1975 to 1980. This was the baseline case. Then he analyzed the impact on employment of two alternative scenarios. The first entailed a defense increase of 30 percent accompanied by a corresponding decrease in other government programs such as health,education and highways. The second case entailed a 30 percent decrease in military spending with corresponding increases in social spending.

The results of the analysis confirm Anderson's findings. Bezdek's 30 percent military spending increase scenario resulted in a net loss of 1.3 percent in employment

as compared to the baseline case. The alternative scenario of the military spending decrease and the non-defense increase, however, caused employment to increase by 2.1 percent over the baseline. [Ref. 7]

Other opponents of large defense budgets focus on the budgetary opportunity costs associated with defense spending. They say, and rightfully so, that economic resources are limited, and that money spent on the national military effort precludes other alternative uses. The concept of budgetary opportunity costs was aptly illustrated in a speech by President Eisenhower:

> The cost of one modern heavy bomber is this: A modern brick school in more that 30 cities. It is two electric power plants, each serving a town of 60,000 population. It is two finely equipped hospitals. It is some fifty miles of concrete highway. [Ref. 3: p. 33]

Some, however, find this approach oversimplified. Smith, in an excerpt from *Democratic Socialism and the Cost of Defense*, argues that one cannot make simple statements of opportunity costs based on alternative expenditures. Smith believes that only real substitutes, where the economic resources can be transferred from one use to another, can be compared. His reasoning is that resources used to produce military goods (ie, the specific materials and skilled labor) could not be used to build and staff schools. In the short run, Smith's reasoning is sound. However, over the long run, there is a great deal of flexibility in the economy and his position may be less valid. [Ref. 3: p. 33]

As one can see, the use of military spending to bolster the economy is a controversial subject. Both proponents and opponents of 'military Keynesianism' can cite studies which support their point of view. What is not disputed is that defense expenditures are unevenly distributed throughout the various states. The next chapter will focus on how DOD funds are distributed among states and the economic repercussions of these expenditures.

III. REGIONAL GROWTH AND THE DISTRIBUTION OF FEDERAL DOLLARS

Since 1950, the U.S. population has grown over 50 percent. As one would expect, this growth has not been evenly distributed over all the states. Some have grown much faster than average, while some states have grown very slowly. As Table 1 indicates, the West has been the fastest growing region since 1950. The South has been the next fastest growing, while the Northeast region has brought up the rear.

TABLE 1

U.S. POPULATION BY REGION, 1950-1980 (IN THOUSANDS)

Region	1980	1970	1960	1950	% Change 1950-80
Northeast	49,137	49,061	44,678	39,478	24.5
North Central	58,854	56,593	51,619	44,461	32.4
South	75,349	62,812	54,973	47,197	59.6
West	43,165	34,838	28,053	20,190	114.0
U.S. Total	226,505	203,304	179,323	151,326	49.7%

Source: Bernard Weinstein,
Regional Growth and Decline in the United States
[Ref. 8]

Population growth is also not evenly distributed throughout each region. Referring to Table 2, Florida shows a huge population increase of 30.7 percent in the ten years between 1976 and 1985. Mississippi, on the other hand, has seen its population increase a modest 7.5 percent during the same period. Likewise, while many northern states have lost population since 1976, certain states within the region--New Hampshire, Vermont, and Maine--have grown at rates at or above the national average.

With birthrates declining, the most important factor in population redistribution has become interregional migration. Since 1965, the Northeast and North Central regions have experienced a significant out-migration of residents while the South and

TABLE 2

POPULATION AND EMPLOYMENT CHANGE, 1976-1985 (%)

State	Population	Total Emp	Mfg Emp
Alabama	7.6	17.9	-0.9
Arizona	35.7	68.6	61.3
Arkansas	8.8	21.6	1.1
California	20.2	35.0	18.6
Colorado	22.8	45.8	23.1
Conneticut	2.9	26.7	0.4
Delaware	4.9	23.6	4.3
Florida	30.7	58.9	37.5
Georgia	16.6	39.0	13.7
Idaho	17.3	16.6	1.3
Illinois	1.5	6.3	-22.3
Indiana	3.4	8.3	-14.9
Iowa	-0.7	6.0	-16.8
Kansas	6.6	17.3	10.0
Kentucky	5.6	12.5	-11.4
Louisiana	13.4	23.1	-16.0
Maine	6.8	22.7	2.6
Maryland	5.2	25.1	-9.2
Massachusetts	1.3	26.7	8.5
Michigan	-0.3	9.6	-9.7
Minnesota	6.0	23.2	9.9
Mississippi	7.5	15.3	-6.9
Missouri	4.2	20.0	-1.3
Montana	8.8	11.6	-8.0
Nebraska	3.7	13.2	0.7
Nevada	44.7	59.2	49.2
New Hampshire	17.8	49.4	19.5
New Jersey	3.0	24.6	-11.2
New Mexico	21.3	36.0	18.2
New York	-1.1	14.5	-15.2
North Carolina	11.8	29.3	5.4
North Dakota	6.2	16.7	-8.0
Ohio	-0.1	6.8	-14.8
Oklahoma	16.9	26.7	-1.8
Oregon	13.3	18.0	-4.7
Pennsylvania	-0.3	5.4	-20.0
Rhode Island	1.9	16.4	-9.4
South Carolina	13.8	25.0	-5.3
South Dakota	3.1	15.9	16.7
Tennessee	10.0	18.0	-1.1
Texas	26.9	42.5	7.4
Utah	29.3	35.0	35.4
Vermont	10.3	33.3	14.1
Virginia	11.1	32.8	4.7
Washington	19.5	38.4	12.3
West Virginia	3.1	0.3	-31.2
Wisconsin	4.1	14.7	-4.6
Wyoming	28.9	32.3	-17.8
National Average	9.7	23.4	-3.0

Sources: Bureau of the Census and Bureau of Labor Statistics

West have attracted many more migrants than they have lost. In fact, the southern states had a net in-migration of 7.5 million persons between 1970 and 1980 and are now attracting more migrants than the West, according to the Bureau of Census. [Ref. 8: p. 9]

Since population growth and employment growth are closely related, it is not surprising that the employment gains of many of the states in the 'Rustbelt' (the area once proudly known as the 'manufacturing belt') have not kept pace with the nation as a whole. Between 1976 and 1985, Table 2 shows that total non-agricultural employment grew by 23.4 percent nationwide, but less than 10 percent in many northern states including Illinois, Indiana, Ohio, Pennsylvania, and Michigan. Contrarily, not one southern or western state experienced employment growth of less than 15 percent for the period. In fact, many of the western states actually saw employment skyrocket by over 35 percent.

The demographic trends are even more pronounced if employment in the manufacturing sector is evaluated. The manufacturing industry as a whole has not fared well in recent years. Between 1976 and 1985, manufacturing jobs in the United States decreased by some 570,000, or approximately 3 percent. This loss of jobs was not equally distributed among states. Some of the biggest losers were West Virginia (-31 percent), Illinois (-22 percent) and Pennsylvania (-20 percent). Yet amidst this backdrop of declining manufacturing fortunes, Arizona, Colorado, California, and Florida were racking up huge gains.

It is interesting to note the correlation between population and employment. Earlier in the chapter, it was noted that the populations of New Hampshire and Vermont grew at rates above the national average, despite being part of a slow-growing region. These same states also showed significant gains in employment well above the national average. While many of their neighbors were suffering with stagnant economies, New Hampshire and Vermont enjoyed total employment gains of 49 percent and 33 percent, respectively.

It is evident that there has generally been a population and employment shift during the past several decades from the industrial North to the Sunbelt. But what is the reason for this interregional shift? Many claim that it is merely the desire of people to live in a more pleasant climate. Some say that this shift is a result of the good 'business climates' fostered by Sunbelt states which includes low wages, a low unionization rate, and local government incentives to business. Others cite differentials in the cost of living as influencing the shift in population.

One popular theory contends that the differential impacts of federal tax and spending policies has been a major cause of regional growth and decline. Northern politicians have frequently declared that the rapid growth of the Sunbelt has come at their states' expense. They cite statistics which show that the Northeast and Midwest states are running a balance-of-payments deficit with the federal government. In other words, they are paying more in federal taxes than they are receiving in federal outlays. To prove their point, they calculated that the states of the Northeast and Midwest sent $165 billion more in taxes to Washington than they got back in federal outlays. Although one's first inclination is to be outraged at the unjustness of the system, there is a logical explanation. The federal government has long been in the business of redistributing wealth. In this case, the people of the Midwest and Northeast are being forced to supplement the lesser incomes of their fellow citizens in the South and other regions. [Ref. 8: p. 25]

Nevertheless, do these regions and states have a valid gripe? It appears not. As Table 3 shows, the Southwest and Rocky Mountain states as well as those of the Mideast and Great Lakes, all show spending to taxation ratios of less than one on a per capita basis, yet the Southwest and Rocky Mountain states have strong, vibrant economies. This would seem to indicate that the federal government taxation spending policies are not to blame for the demise of these regions.

But what happens if defense spending, the single largest component of federal expenditures, is considered alone. The DOD budget is now well over the $300 billion mark. According to a study done be the Data Resources research firm, since 1979 defense spending as a share of gross national product has increased from a postwar low of 4.9 percent to 6.6 percent in 1986. And, within the durable manufacturing sectors, the defense share has nearly doubled since 1980. In addition, between 1981 and 1986, increases in defense production accounted for an addition of 676,000 new jobs, or a 5.8 percent annual rate. [Ref. 1: p. 1]

Not all states have gotten an equal share, as one would expect. That has historically been the case. The goods and services needed for defense are not found evenly distributed throughout the various states. The states with large, diversified industrial bases, such as California and New York, are going to be among the states which receiving a majority of the defense outlays. In fact, California received 20.7 percent of the prime contract dollars followed by Texas and New York with 7.5 percent and 7.2 percent respectively. Table 4 is provided to give the reader a clearer idea of

TABLE 3

FEDERAL GOVERNMENT SPENDING AND TAXES PER CAPITA, FY82

Region	Federal Spending per Capita	Federal Taxes per Capita	Spending Taxes Ratio
New England	$3,089	$3,044	1.01
Mideast	2,745	3,427	0.80
Great Lakes	1,984	2,976	0.66
Plains	2,461	1,900	1.30
Southeast	2,538	1,725	1.47
Southwest	2,350	3,022	0.78
Rocky Mountain	2,416	2,626	0.92
Far West	3,001	2,708	1.11
U.S. Total	2,573	2,573	1.00

Source: Bernard Weinstein,
Regional Growth and Decline in the United States
[Ref. 8]

how the defense dollars have been distributed among states. It also shows which states received the lion's share of the recent increases in military outlays. (Defense outlays in this table include all prime contract awards plus military and civilian payrolls in 1972 dollars.)

Undoubtedly, these significant federal outlays which enter a state have created many jobs and accounted for some of the overall growth in employment. Just how important defense dollars are to a state's economy has been the subject of much speculation and study for many years. To begin with, dollars alone do not give a clear picture of the actual impact of defense spending on an area. Other important considerations include the size of the total labor force, the number employed on defense contracts, and other defense-generated employment such as the servicing of military bases [Ref. 2: p. 35]. Using these factors, the DOD performed a study in 1967 to develop a 'defense dependency ratio'--the ratio of total defense-generated employment to a state's total workforce. The results showed that Alaska was the most dependent of defense spending (due to the high ratio of military personnel to total population) even though in 1966 Alaska placed 44th in prime contract awards. California, which ranked first in prime contract awards, placed eighth in defense dependency. New York ranked 31st in defense dependency despite rating second in prime contract awards [Ref. 9].

TABLE 4

DEFENSE SPENDING BY STATE (IN BILLIONS OF 1972 DOLLARS)

State	1976	1985	% Change
Alabama	.767	1.032	34.5
Arizona	.796	1.053	32.4
Arkansas	.194	.429	121.3
California	10.201	15.058	47.6
Colorado	.777	1.005	29.5
Conneticut	1.573	2.354	49.6
Delaware	.095	.015	60.4
Florida	1.632	3.122	91.2
Georgia	1.154	2.173	88.4
Idaho	.072	.066	-7.8
Illinois	.885	1.152	30.1
Indiana	.833	1.459	75.0
Iowa	.201	.248	23.6
Kansas	.523	1.067	103.9
Kentucky	.649	.573	-11.6
Louisiana	.518	1.021	97.2
Maine	.289	.478	65.2
Maryland	1.647	2.573	56.2
Massachusetts	1.749	3.263	86.6
Michigan	.977	1.313	34.5
Minnesota	.592	.942	58.9
Mississippi	.983	.739	-24.8
Missouri	2.229	3.311	48.6
Montana	.083	.078	-5.9
Nebraska	.184	.222	21.0
Nevada	.114	.141	22.9
New Hampshire	.244	.384	57.3
New Jersey	1.204	1.959	62.8
New Mexico	.326	.419	28.3
New York	2.970	4.308	45.1
North Carolina	1.121	1.262	12.6
North Dakota	.248	.175	-29.1
Ohio	1.230	2.328	89.3
Oklahoma	.717	.694	-3.2
Oregon	.084	.122	44.8
Pennsylvania	1.615	2.258	39.8
Rhode Island	.184	.268	45.8
South Carolina	.725	.817	12.6
South Dakota	.078	.080	2.6
Tennessee	.440	.444	1.0
Texas	3.540	5.722	61.7
Utah	.387	.591	52.8
Vermont	.108	.071	-34.5
Virginia	3.022	4.983	64.9
Washington	1.638	2.062	25.9
West Virginia	.085	.043	-49.0
Wisconsin	.234	.458	96.2
Wyoming	.062	.086	39.7
TOTAL	49.977	74.560	49.2%

Sources: Bureau of the Census and Bureau of Labor Statistics

The need for a more up-to-date measure of a state's defense dependency prompted the author to develop Table 5, in which defense dependency is defined as the ratio of DOD expenditures to total personal income within a state. DOD expenditures are a conglomeration of military and civilian payrolls plus all prime contract awards. Interestingly, the results bear a striking similarity to the findings of the 1967 DOD study despite the passage of nearly two decades. California is rated 6th in defense dependency, while New York is rated 32nd. Virginia, which receives a large share of the Navy dollars, is second only to Alaska.

When evaluating the impact of defense spending on a state's economic health, it is important to consider how that money is distributed. If the outlays are distributed among many firms, the impact on the state economy is minimal if any one firm loses its DOD business. On the other hand, one can understand the apprehesion about the dependence of certain states or metropolitan areas on one or two large defense contractors. A seemingly small cut in a particular program could have a devastating effect on impacted area. Missouri and Washington are two such states which rely heavily on one or two large defense contractors. For instance, Missouri, which ranked third in defense dependency in 1985, received a total of $8.8 billion that year in defense expenditures, according to the Defense Department's *1985 Atlas State Abstract for the United States*. Of that, $7.6 billion was awarded on prime contracts. McDonnel Douglas received $6.5 billion of the prime contract awards or 73 percent of all the DOD outlays that year. Washington is another example of a state which is not only heavily dependent on defense but on one company. In 1985 Boeing received 79 percent of the defense prime contract awards in Washington, which amounted to $2.82 billion . Obviously, a sharp reduction in defense outlays going to either Boeing or McDonnel Douglas would have an immediate and substantial impact on employment in these states. History bears evidence to this fact.

Clearly, the economic benefits provided to a state through defense spending are important. Thousands of people are working this minute on defense-related projects. It is also apparent that some states, such as California, get a lion's share of the defense dollars.

But does this influx of defense money actually shape the economic future of the states or does it merely migrate to states with strong industries and economies? Look at what happened in Massachusetts. According to Table 4, defense expenditures in Massachusetts increased a whopping 86 percent between 1976 and 1985. This same

TABLE 5

DEFENSE DEPENDENCY BY STATE

State	Defense Outlays / Total Personal Income	
	1976	1985
Alabama	5.2	5.6
Alaska	14.1	13.9
Arizona	7.6	6.0
Arkansas	2.3	4.0
California	8.3	8.2
Colorado	5.9	4.9
Conneticut	8.8	9.5
Delaware	2.9	4.0
Florida	4.1	4.6
Georgia	5.3	6.7
Idaho	1.9	1.4
Illinois	1.4	1.6
Indiana	3.2	4.9
Iowa	1.4	1.6
Kansas	4.9	7.3
Kentucky	4.4	3.3
Louisiana	3.1	4.7
Maine	6.4	8.0
Maryland	7.2	8.6
Massachusetts	5.8	7.9
Michigan	2.0	2.5
Minnesota	3.1	3.7
Mississippi	11.7	7.1
Missouri	10.0	11.5
Montana	2.5	2.0
Nebraska	2.5	5.4
Nevada	3.2	5.4
New Hampshire	6.2	6.0
New Jersey	2.9	3.5
New Mexico	6.7	6.1
New York	3.0	3.5
North Carolina	4.8	4.0
North Dakota	8.4	4.9
Ohio	2.3	3.8
Oklahoma	5.7	4.0
Oregon	0.7	0.8
Pennsylvania	2.7	3.3
Rhode Island	4.0	4.6
South Carolina	6.3	5.3
South Dakota	2.9	2.3
Tennessee	2.5	1.9
Texas	5.8	6.0
Utah	7.4	7.9
Vermont	5.3	2.5
Virginia	12.0	13.9
Washington	8.3	7.8
West Virginia	1.1	0.5
Wisconsin	1.1	1.7
Wyoming	3.0	3.0

Sources: Department of Defense and Bureau of Economic Analysis

period was accompanied by very strong economic growth in the state and manufacturing employment rose by 8.5 percent. One might readily conclude that economic prosperity was a direct result of the military buildup.

But then take Arizona. Arizona had an astonishing 35 percent growth in population between 1976 and 1985. During this same period, Arizona outperformed every other state in percent employment growth by a tremendous margin. Yet defense spending in the state increased at a slower than average rate.

In an effort to clear up some of the confusion, an econometric model was developed to explore the relationship between defense spending and employment. That model and the results are presented in the next chapter.

IV. THE MODEL

A. AN OVERVIEW

If differences in regional growth were simply and directly correlated with the differences in costs and benefits in regions, it would be a simple matter to determine what causes states to grow. Unfortunately, it is not that simple. For example, the South has lower taxes, wage rates, and crime rates plus a lower degree of labor unionization than the rest of the nation. Many experts claim that this is the reason for the tremendous growth in the Southern states. Yet the West is also a fast-growing region and its wages, taxes and crime rates are among the Nation's highest. In sum, these factors, as well as many others, may affect regional growth, but their relationships are far too complex to understand with a simple comparison. [Ref. 10: p. 4]

Instead, the effect of each factor should be measured while holding all other factors constant. This is accomplished using multiple regression analysis. It allows one to look at all factors simultaneously and determine which factors are important in explaining regional growth. Regional growth can be measured in many ways. Several studies have used total state personal income as the measure of regional economic growth. In fact, this analysis is based largely on a thesis done by Brian Finch in which he studied the effects of defense spending on personal income growth within states. Finch, using a single equation model, discovered that state personal income growth was highly affected by defense procurement expenditures and state government spending for health, education, and highways. [Ref. 11]

Finch, in turn, based his study primarily on a work by Helms. Helms used a time-series, cross section approach to explore the effect of state and local taxes on economic growth. As did Finch, Helms measured economic growth in terms of state personal income growth. Helms analyzed his model using a least-squares regression. Of great importance to this and Finch's work was the conclusion that the fixed state and time effects must be accounted for in the model through the use of dummy variables. [Ref. 12]

Similarly, this study uses a multiple regression model with pooled, cross-sectional data for the 48 contiguous states during the period 1976 to 1985 to determine the effect

of defense spending on regional growth. But in this analysis, regional growth was measured in terms of employment growth. The model analyzes the impact of defense spending, which includes military and civilian pay as well as prime contract awards, on total employment as well as manufacturing employment, wholesale and retail trade employment, and services employment. Other factors, such as state expenditures for welfare payments, highways, health, and education as well as certain 'business climate' variables were included to make the model a more accurate predictor.

The model is also based in part on a model employed by Carlino and Mills (1985) to find the determinants of county growth. They used a simultaneous equation model which considered the flow of people and jobs--for both jobs and people attract each other [Ref. 10: p. 4]. People, when choosing where to live, are attracted to areas which offer good prospects for employment and income growth. Firms, on the other hand, look to locate in areas which offer a large workforce potential and a large market. As an area grows, the demand for goods and services grows, which in turn draws new firms and new employment opportunities. Muth, in his examination of migration and employment growth, verified the existence of this relationship between population and employment growth [Ref. 13]. To capture this mutually reinforcing relationship, his model made use of simultaneous equations. The first equation was used to predict a state's population based on certain relevant variables, such as change in employment and per capita state expenditures. Then, the predicted value for population was entered as an independent variable in the equation for employment.

B. VARIABLES

1. Dependent Variables

The dependent variables used in the analysis were total non-agricultural employment, manufacturing employment, wholesale and retail trade employment, and services employment. While most prior studies were only concerned with changes in manufacturing employment, today's economy dictates that other sectors be included. Manufacturing employment has been declining over the years to the point where it is no longer dominant. On the other hand, employment in the service industry has grown rapidly and today accounts for a significant portion of total employment.

2. Independent Variables

There were five basic categories of independent variables: (1) defense expenditures; (2) state expenditures for welfare and health, education and highways; (3)

proxies to represent the state's business climate; (4) predicted population; and (5) dummy variables to capture the state and time effects. All monetary variables were adjusted to 1972 dollars to compensate for inflation and converted to billions of dollars. Defense and state expenditures were adjusted using the implicit price deflators for defense and state expenditures as published in the Survey of Current Business. All other monetary variables were adjusted using the GNP implicit price deflators.

a. Defense Variables

Of primary importance to the analysis were the variables for defense expenditures. The model was estimated with three variations. First, all defense expenditures were considered as one single variable which included military and civilian pay, plus all prime contract awards. A second run broke defense expenditures into two categories: (1) military and civilian pay, and (2) all prime contract awards. The final analysis segregated defense spending into six separate variables: (1) military pay (MILPAY); (2) civilian pay (CIVPAY); (3) procurement contract awards (PROCCON); (4) service contract awards (SERVCON); (5) research and development contract awards (RDCON); and (6) construction contract awards (CONSCON). Procurement contracts are issued for items such as weapons, aircraft, medical and dental supplies, and petroleum. These contracts account for the largest portion of DOD purchases, comprising approximately 65 percent of the annual budget. Service contracts are usually awarded for such base services as garbage collection, computer maintenance, and janitorial services. About 17 percent of the purchases budget goes for service contracts. Thirteen percent is dedicated for research and development, while the remaining five percent is allocated to the construction of new facilities. By dividing defense into smaller subcategories, it was hoped that the varying impact of different types of defense spending would become evident.

b. State and Local Expenditure Variables

The effect of state and local government expenditures on an economy has long been debated and studied. A fairly common opinion was that money spent on highways, health, and education (STHEH) had a positive effect on economies. Spending money for welfare payments (STWEL), however, was hypothesized to reduce growth prospects. Helm's 1985 study of the effects of state and local taxes on economic growth added credence to this theory [Ref. 12: p. 581]. He concluded that devoting tax revenues to transfer payments would likely do less for economic growth than spending the money on public services such as education, highways, and health care.

Finch (1987) also found that state moneys spent for education and highways were a positive factor in economic growth [Ref. 11: p. 44]. Plaut and Pluta (1983) also noted that states which spent more on education, in terms of a percentage of personal income, experienced a greater growth in employment. Unexpectedly, their results also indicated that industry was attracted to states with high welfare expenditures [Ref. 14: p. 114]. Another analysis by Wazylenko and McGuire (1985) had basically similar results [Ref. 15: p. 506].

The state and local spending data for this model came directly from the sources listed in Appendix A. State and local expenditures included all moneys received as transfers from the federal government.

*c. **Business Climate Variables***

Business climate variables were included because many state and local public officials, along with businessmen, have placed increasing emphasis on the importance of this factor in fostering economic growth. In fact, many state officials believe that they can attract business by offering tax breaks, revenue-bond financing, and other special incentives. The proxies used to measure the state's business climate were the average manufacturing wage (MANWAGE) and the effective corporate tax rate (CORTXPY). Although business climate's definition is comprised of many factors, these two proxies should prove an adequate measure.

The average manufacturing wage rate was included to represent the labor cost associated with a decision to locate a business in a state. The *a priori* expectation was that businesses would choose to locate in areas where the cost of labor was low. Indeed, much of the growth of employment in the Southern states has been attributed to the lower than national average wages.

Interestingly, the studies that have been done to measure the impact of wage costs on regional economies have yielded a split decision. Wasylenko and McGuire found the wage rate to be negative and significant [Ref. 15: p. 506]. Finch found a negative but insignificant coefficient for the wage rate in his study [Ref. 11: p. 44]. At the opposite end of the spectrum, Plaut and Plutas' analysis showed that higher wages had a strong and significant positive effect [Ref. 14: p. 112].

The corporate tax rate proxy was measured by total state corporate tax revenue relative to total corporate income. This measure of the effective tax rate was felt to be a stronger factor in business location decisions than a net corporate tax rate because businesses look beyond the obvious nominal rate and locate according to

effective rates of taxation, ie. actual tax liability. In addition, tax rates are not comparable across states because of different exemptions, etc.

d. Predicted Population

The variable for predicted population (POPHAT) was derived from a regression model using population as the dependent variable. A predicted value for population was generated through this separate regression to eliminate any error which would result from having two highly interdependent variables (population and employment) in the same regression equation. The independent factors used to predict population included: (1) population lagged one year (POPLAG); (2) the change in total employment for the year(DELTEMP); (3) population density (POPDEN); (4) average manufacturing wage (MANWAGE); (5) per capita personal income (PCPERINC); (6) per capita state spending on highways, education and health (PCSTHEH); (7) per capital state spending on welfare (PCSTWEL); and (8) an income tax proxy (INCTXPY). (The income tax proxy attempted to measure the state's effective income tax by measuring total state and local income tax revenue relative to the state's total personal income.) The resultant model was a very accurate predictor of population as the R-square value was 0.999. As anticipated, the variable for population lagged one year contributed most toward the fit of the equation. All other variables were significant at least at the five percent level. The variables DELTEMP, PCSTHEH, and PCPERINC all had a positve impact on population growth (listed in decreasing order). The variables which had a negative impact on population growth were INCTXPY, MANWAGE, POPDEN, and PCSTWEL. (See Appendix B for the results.)

The mean, maximum, minimum, and standard deviation for predicted population and the other variables are presented in Table 6.

e. Dummy Variables

Helms included in his model binary, or dummy, variables to represent both the state and time effects of the cross-section data. Helms claimed that both the state and time effects must be treated as fixed and thus binary variables were used. The state dummies capture the effects of unmodeled differences between states. Climate, relative location, existence of right to work laws, and pollution are examples of the factors which dummy variables encapture. [Ref. 12: pp. 575-576]

In this model, the dummy variable for Wyoming was deleted as the reference state. Therefore, the state dummies reflect employment differences as

TABLE 6

DESCRIPTIVE STATISTICS

VARIABLE	MEAN	STD DEV	LABEL
TOTEMP#	1.837	1.927	TOTAL NON-AG EMPLOYMENT
MFGEMP#	.406	.425	MANUFACTURING EMPLOYMENT
WREMP#	.420	.441	WHOLESALE-RETAIL TRADE EMP
SEREMP#	.378	.466	SERVICE EMPLOYMENT
DODTOTAL*	1.245	1.925	TOTAL DOD EXPENDITURES
PERSPAY*	.410	.579	MILITARY AND CIVILIAN PAY
DODCONS*	.835	1.439	TOTAL DOD CONTRACTS
MILPAY*	.216	.329	MILITARY PAYROLL
CIVPAY*	.194	.270	CIVILIAN PAYROLL
PROCCON*	.546	.916	PROCURMENT CONTRACTS
SERVCON*	.147	.250	SERVICE CONTRACTS
RDCON*	.124	.313	R&D CONTRACTS
CONSCON*	.018	.029	CONSTRUCTION CONTRACTS
STHEH*	1.392	1.391	STATE EXP HEALTH,ED,HIWAYS
STWEL*	.493	.748	STATE EXP WELFARE
CORTXPY	.008	.004	CORPORATE INCOME TAX PROXY
MANWAGE	3.964	.569	AVERAGE MANUFACTURING WAGE
INCTXPY	.016	.011	PERSONAL INCOME TAX PROXY
DELTEMP	.027	.033	CHANGE IN EMPLOYMENT
PCPERINC	5.061	.724	PERCAPITA PERSONAL INCOME
PCSTHEH	.314	.062	PERCAPITA STATE EXP HEH
PCSTWEL	.089	.036	PERCAPITA STATE EXP WELFARE
POPDEN	.159	.224	POPULATION DENSITY(000/MILE)
POP#	4.711	4.771	POPULATION
POPHAT#	4.711	4.770	PREDICTED POPULATION

\# in millions

* in billions of 1972 dollars

compared to the omitted state, Wyoming. This would lead one to expect that the dummy coefficients for almost all states would be positive.

The year dummies were used to remove the effects of the anticipated yearly upward shifts in a state's employment. The omitted year was 1985, so the nine dummies representing the years 1976-1984 should be negative if the hypothesized upward trend is valid. (The dummy variables are listed in Appendix C.)

C. CORRELATION ANALYSIS

A key assumption in any regression analysis is that the dependent values are random variables which are independent and normally distributed for fixed levels of the independent variables. To test whether or not an econometric model meets this important assumption, a correlation analysis was performed. A correlation analysis measures the degree to which variations in one variable are related to changes in another variable; in other words, are linearly related.

Appendix D shows the correlation matrix for the variables. A correlation coefficient of 1.0 represents perfect correlation. Coefficients close to 1.0 indicate a strong linear relationship between the two variables and lead one to expect a multicollinearity problem. This situation arises frequently in empirical studies using time-series data. Economic time-series data tends to move together often reflecting underlying factors such as trends and cycles. [Ref. 16: p. 152]

An examination of the simple correlation coefficients reveals that there is multicollinearity between all the defense spending variables. For example, the correlation coefficient between civilan pay (CIVPAY) and military pay (MILPAY) is very high at 0.87. One would expect this because civilians and military personnel serve at the same bases. SERVCON and CONSCON are also highly related to MILPAY (0.79 and .81 respectively). This is due to the fact that there will be more construction going on and more services required where a larger number of military persons are stationed. There is a high degree of correlation between population (POP) and all the federal defense spending variables as well as the state spending variables for welfare and health, education and highways. It is to be expected that states with larger populations get more of the total government dollars than smaller states, even if the per capita spending is equal or greater.

What this multicollinearity problem means to theorists is that while a model may show a good fit, or a high F-statistic, the separate effects of the individual explanatory variables will be difficult to distinguish (i.e., the T-ratios would indicate that most of the correlated variables were insignificant). The results of this model, despite the use of linearly-related explanatory variables, indicate that multicollinearity is not a problem, since a majority of the variables are statistically significant. [Ref. 16: p. 152]

D. RESULTS

The estimation procedure used in the model was ordinary least squares regression on SPSSX. The model was regressed three times for each sector of employment: total non-agricultural employment (TOTEMP), manufacturing employment (MFGEMP), wholesale and retail trade employment (WREMP), and services employment (SEREMP). The first regression used the variable for total defense pay and prime contract expenditures (DODTOTAL). The results are listed in Table 7. The second regression was done using total military and civilian pay (PERSPAY) and total prime contracts (DODCONS) and the results are shown in Table 8. Table 9 gives the results

using the complete breakdown of defense expenditures. (The regression equations and the complete results are contained in Appendices E, F, and G, respectively.)

TABLE 7

REGRESSION COEFFICIENTS AND (T-RATIOS) OF EMPLOYMENT MODEL USING DODTOTAL

Variable	Total	MFG	Wholesale/ Retail Trade	Services
DODTOTAL	.0472 (3.088)	-.0176 (-2.637)	.0157 (4.155)	.0792 (2.447)
STHEH	.1143 (2.921)	.1140 (7.264)	.0046 (.517)	-.1056 (-1.391)
STWEL	.1753 (2.921)	-.1232 (-4.698)	.0533 (3.604)	.2702 (2.128)
MANWAGE	.0043 (.097)	.0246 (1.266)	.0043 (.390)	-.0373 (-.397)
CORTXPY	-.0020 (-.682)	-.0002 (-.161)	-.0001 (-.199)	-.0051 (-.821)
POPHAT	.3934 (18.414)	.0372 (3.985)	.1115 (21.198)	.1084 (2.399)
R-square	.998	.993	.998	.871

It is easiest to review the results if the defense spending variables are considered industry by industry. Due to the large number of variables and their widely varied coefficients, analysis by any other method just leads to confusion. The results for state and local expenditures, however, are less confusing and can be better analyzed according to the type of expenditure.

1. DEFENSE EXPENDITURES

a. Total Employment

As expected, total defense spending has a positive and statistically significant effect for growth in overall employment. The results of the second regression, shown in Table 8, however, show that only prime contract spending has a positive effect. Pay for military and civilian personnel has a decidedly negative influence on growth. The reason for this should be pursued. One would theorize that

TABLE 8

REGRESSION COEFFICIENTS AND (T-RATIOS) FOR EMPLOYMENT USING DODCONS AND PERSPAY

Variable	Total	MFG	Wholesale/ Retail Trade	Services
DODCONS	.0771 (4.338)	-.0251 (-3.202)	.0227 (5.178)	-.0121 (-.326)
PERSPAY	-.1500 (-2.363)	.0315 (1.129)	-.0308 (-1.971)	.6804 (5.142)
STHEH	.1235 (3.488)	.1115 (7.097)	.0069 (.789)	-.1362 (-1.831)
STWEL	.1688 (2.841)	-.1216 (-4.645)	.0517 (3.532)	.2902 (2.341)
MANWAGE	.0197 (.448)	.0207 (1.063)	.0079 (.727)	-.0846 (-.917)
CORTXPY	-.0017 (-.602)	-.0003 (-.211)	-.0001 (-.117)	-.0058 (-.969)
POPHAT	.3770 (17.327)	.0413 (4.311)	.1076 (20.072)	.1588 (3.498)
R-square	.998	.993	.998	.877

money spent for military pay would create more jobs than spending in other areas because the average military pay is generally lower than the civilian average wage. The results of this study lead one to question this theory.

The effect of spending for the various categories of prime contracts is as expected. The coefficients for PROCCON and SERVCON are positive and significant. R&D expenditures prove to have a negative effect on employment growth. The impact of CONSCON is positive but not significant, probably because the dollar value of CONSCON awards is insignificant when the economy is considered as a whole.

b. Manufacturing Employment

The impact of defense spending on the growth of manufacturing employment is startling if one is to believe the results of this study. The coefficient for DOD spending as a whole is negative and significant. The coefficient for total DOD contracts is negative. In fact, the coefficients for procurement, service, R&D, and construction contracts all reflect a negative relationship with manufacturing

TABLE 9

REGRESSION COEFFICIENTS AND (T-RATIOS) FOR EMPLOYMENT USING COMPLETE BREAKDOWN OF DEFENSE SPENDING

Variable	Total	MFG	Wholesale/ Retail Trade	Services
PROCCON	.0731 (3.332)	-.0169 (-1.703)	.0246 (4.534)	-.0486 (-1.039)
SERVCON	.4080 (4.942)	-.1054 (-2.819)	.0956 (4.676)	.4858 (2.758)
RDCON	-.1727 (-2.688)	-.0586 (-1.998)	-.0411 (-2.564)	-.2423 (-1.754)
CONSCON	.4072 (1.407)	-.0306 (-.234)	.1255 (1.751)	.5399 (.875)
MILPAY	-.1375 (-1.532)	.1107 (2.724)	-.0381 (-1.713)	.7188 (3.756)
CIVPAY	-.5388 (-2.463)	-.1085 (-1.095)	-.0692 (-1.277)	-.0894 (-.192)
STHEH	.0815 (2.264)	.1026 (6.296)	-.0022 (-.248)	-.1918 (-2.499)
STWEL	.2034 (3.398)	-.1420 (-5.234)	.0620 (4.176)	.3334 (2.610)
MANWAGE	.0360 (.824)	.0301 (1.523)	.0116 (1.073)	-.0651 (-.699)
CORTXPY	-.7816 (-.275)	-.0390 (-.030)	.0190 (.027)	-3.781 (-.624)
POPHAT	.3778 (17.947)	.0411 (4.313)	.1076 (20.636)	.1606 (3.576)
R-square	.998	.994	.998	.882

employment growth. The *a priori* expection was that at least procurement contracts spending would be beneficial to the manufacturing industry. Why this is not true is difficult to ascertain and certainly deserves further study. To further confuse the issue, the only DOD expenditure variable with a positive and significant coefficient is MILPAY. Perhaps the reason for this is that a majority of the military personnel are stationed in the western and southern states, which happen to be the only regions which, in general, experienced a growth in manufacturing employment between 1976 and 1985.

c. Wholesale and Retail Trade Employment

Defense outlays affect employment growth in the wholesale and retail trade sector in much the same way that they affect total employment. The coefficient for defense outlays as a whole is positive and significant as is the coefficient for all prime contracts (DODCONS). Payroll (PERSPAY) expenditures are significant and negative. In the final breakdown, Table 9 indicates a negative coefficient for MILPAY, RDCON, and CIVPAY, which are significant except in the case of CIVPAY. All other contract variables have positive and significant coefficients with the greatest impact being associated with CONSCON. Since construction projects generally require large purchases of wholesale goods such as lumber, cement, and other building articles, the result is not surprising.

d. Service Employment

The last sector to be analyzed is services. Once again, total defense spending is a positive factor in employment growth. But this time, payroll outlays have the positive and significant coefficient while the coefficient for contracts (DODCONS) is insignificant but negative. Looking at Table 9, it can be seen that the coefficients for MILPAY and SERVCON are positive and significant. That the SERVCON coefficient is positive tends to confirm the validity of the model; for surely if the coefficient was negative, the entire model would be seriously flawed. It is interesting to speculate why spending for military pay would be a boon to the services industry. The relationship probably has no foundation in military pay per se, but rather that service contracts are inherently associated with providing services to a military facility or base. More service contracts are needed at larger bases, and large bases naturally have more personnel and thus larger payrolls.

2. STATE AND LOCAL EXPENDITURES

a. For Welfare (STWEL)

The coefficients for STWEL are positive and highly significant in every area but manufacturing. This is somewhat surprising given that conventional wisdom says that high welfare payments are bad for business. However, conventional wisdom is based on studies of manufacturing employment or personal income, and indeed this study does show that high welfare expenditures hinder manufacturing employment growth. As an explanation, welfare dollars usually are spent at supermarkets, department stores, fast food restaurants, and other retail and service related outlets. Greater welfare budgets also translate into larger administration organizations. Therefore, welfare payments would indeed add jobs to the local economy.

b. For Health Care, Education, and Highways (STHEH)

As anticipated, STHEH has a positive and significant effect on total employment growth and manufacturing employment growth in all three regressions. The results correspond to the findings of Helms (1985), Finch (1987) and Wasylenko (1985). An interesting result of this study, however, is that STHEH has no significant effect on employment growth in the wholesale and retail trade sector. and a significant but negative impact on service employment growth. As the service sector includes teachers and health care workers it is difficult to understand why increased state spending in thoses areas would not have a favorable impact.

Another interesting point is that the coefficients for STWEL are greater than those for STHEH when considering total employment, indicating that more jobs are created as a result of spending for welfare rather that health, education, and highways--a truly controversial idea. But perhaps there is a simple explanation. Welfare expenditures impact on areas of the economy where wages are low (i.e., cashiers and restaurant employees), whereas expenditures on health, education, and highways impacts higher wage earners. Doctors, nurses, teachers, engineers, and heavy equipment operators all receive fairly high wages. Therefore, dollar for dollar, welfare spending creates more jobs over the short run. Over the long run, the indirect effects of spending on health, education, and highways could easily outweigh these benefits. But this study does not pretend to offer that kind of detailed analysis.

3. BUSINESS CLIMATE VARIABLES

In most cases the coefficients for the average manufacturing wage (MANWAGE) are positive while those for the corporate tax proxy (CORTXPY) are negative. However, they are all insignificant for every case. This would indicate that industry pays little attention to wage and tax rates. This is not a rare conclusion. Wasylenko and McGuire stated in their study that "most research on business location concludes that business climate has no effect or, at most, very little effect on business location decisions" [Ref. 15: p. 497]. Wheat agrees with their conclusion, stating that the tax hypotheses have been repeatedly discredited. Instead, Wheat credits markets as the leading factor in regional growth [Ref. 17: p. 21].

4. PREDICTED POPULATION (POPHAT)

The variable POPHAT is positive and very significant for all of the sectors, but especially for total employment and wholesale and retail trade employment. The resulting conclusion, then, is that employment growth and population growth are

strongly correlated. This is a finding which has been well documented by other researchers such as Muth. Also, because population growth increases the number of jobs, factors that affect population (the dependent variable in the first equation) also affect employment. For example, a high level of percapita personal income within a state is a factor contributing to population growth. This increase in population, in turn, causes a growth in employment. So, indirectly, this high level of percapita personal income creates jobs.

V. SUMMARY AND CONCLUSIONS

The results of this study support the hypothesis that defense spending is an important aspect of regional growth. Simply put, defense expenditures create jobs.

Does it create as many jobs as the DOD portrays? While the model was not meant to provide estimates of a specific number of jobs created, it is interesting to note that the resulting coefficients for total DOD spending indicated that an additional one billion 1972 dollars would create 47,238 jobs. That translates to 21,278 jobs per one billion 1982 dollars. In Chapter 3 it was stated that the Defense Department estimated that this same amount would add 35,000 full and part-time jobs to the economy. The Bureau of Labor Statistics estimated that a billion dollars spent purchasing military goods added about 29,200 new jobs. So, it appears that the results of this study suggest a somewhat smaller impact than earlier studies.

But are all types of defense outlays necessarily good for the economy? The results indicate not. Expenditures for R&D appear from the results to negatively influence employment growth. This negative impact is not limited to total employment statistics, but extends to all the studied industry groups--manufacturing, wholesale and retail trade, and services. On the other hand, the coefficients for service and procurement contracts indicate that they provide the greatest benefit in terms of total employment gains. Of the two, spending for services seems to create many more jobs.

A corroborating finding is that defense spending as a whole has the most significant positive impact on the employment in the services industry. A breakdown of military expenditures shows that military pay and service contract awards are primarily responsible. The author speculates that this industry is the prime beneficiary of defense spending because service industries are very labor intensive. In addition to being labor-intensive, the wages of the services employees are typically lower than those in the other industies, such as manufacturing. Janitors, food-service workers, clerical assistants, and other service-related employees frequently earn little more than minimum wage. What this means, is that dollar for dollar, money going for services provides more jobs than money going for supplies. (Table 10 gives examples of the job creation potential of many different industries.)

TABLE 10

JOBS CREATED PER BILLION 1981 DOLLARS OF FINAL DEMAND
FOR THE TOP INDUSTRIES SERVING THE DOD

Industry	Type	% DOD Total	Direct	Indirect	Total
Aircraft	MFG	19.0	12,318	13,522	25,840
Comm. Equip	MFG	17.4	11,556	13,233	24,789
Missiles	MFG	6.9	7,773	10,481	18,254
Ordnance	MFG	6.0	12,631	14,722	27,353
Ship Bldg Repair	MFG	5.5	18,051	14,341	32,393
Air Transport	TRANS	3.3	10,414	11,571	22,165
Business Services	SERV	3.0	24,904	8,006	32,910
Motor Vehicles	MFG	2.8	6,599	15,587	22,186
Construction	CONST	2.7	NA	NA	NA
Communications	COMM	2.4	9,173	4,232	13,405
Chemicals	MFG	2.0	6,857	11,819	18,676
Maint Repair	CONST	2.0	13,175	11,241	24,416
Wholesale Trade	TRADE	1.9	19,769	6,619	26,388
Petroleum	MFG	1.8	2,412	11,024	13,436
Computers	MFG	1.7	10,523	14,046	24,569
Educ. Services	SERV	1.4	53,997	7,202	61,199
MEDIAN MFG IND	NA	NA	NA	NA	26,291
MEDIAN NON-MFG	NA	NA	NA	NA	30,030

Source: Robert Degrasse,
Military Expansion and Economic Decline
[Ref. 18]

The lone industry that suffered as a result of military spending, was manufacturing. This is hard to understand. Much of the increased spending since 1980 has been into the procurement program so it seemed reasonable to expect some positive impact.

Assuming that the model for manufacturing was flawed, the author went looking for a cure. Bolton, in his book *Defense Purchases and Regional Growth*, noted that outlays for defense procurements were spread out over several years from the date of the award. Therefore, he included a timing adjustment in his model to account for the lag of expenditures after contract awards. Specifically, he included 60 percent of the contract value in the year of the award, 30 percent in the following year, and the remaining 10 percent in the third year. [Ref. 19: p. 60]

Hoping to improve the model's results, lags similar to Bolton's were incorporated into the model. These changes, however, had little impact on the results. Defense spending still had a deleterious effect on manufacturing employment growth. (The equation and results are contained in Appendix H.)

So, how does one explain these results? Degrasse offers the following explanation.

> Most industries selling to the Pentagon create fewer jobs per dollar spent than the average industry in the American economy (Table 10). Seven of the 11 manufacturing industries selling the greatest volume of goods to the military create fewer jobs per dollar than the median manufacturing industry. Seven of the nine largest military suppliers create fewer jobs per dollar tha the median non-manufacturing insustry. More importantly, the three largest manufacturing industies--those accounting for over 40 percent of the Pentagon's total purchases from the private sector--create fewer jobs per dollar than the median manufacturing industry. [Ref. 18: p. 12]

The impact of specific categories of defense expenditures tended to vary greatly between industries, except in one case. The effect of R&D outlays was consistent from industry to industry--negative. The clear implication is that military spending for R&D is a very poor way to stimulate employment.

This conclusion should not come as a surprise. A recent estimate found that fully one-third of all full-time U.S. research scientists and engineers were working on military or space-related projects. This tremendous drain of scientists and engineers from the civilian market can only hurt the economy. To remain competitive in the world market requires constant productivity improvements and frequent product innovations. This can only be accomplished with R&D inputs. Government-financed, civilian-oriented R&D is one of the reasons why Japan is a world leader in manufacturing.

The results also imply that the spillover effects from R&D are not as great as the Pentagon claims. Much if not most military and space research has little value for civilian industrial or other uses.

> A considerable part of space and military R&D efforts are devoted (1) to the preparation of research proposals and other presentations; (2) to the design, engineering, and testing of prototype weapons, space instruments, and space vehicles; (3) to the delicate modifications of instruments, mechanisms, and materials in the unique variation required for unique tasks; and (4) to the planning, scheduling, and integration component developments into a complex space and weapons system. None of these are likely to have any general value or be of conceivable relevance to the advance of the civilian technology. [Ref. 20]

Conclusions to this point are that military spending, in general, creates jobs within the states; spending for R&D does not; the manufacturing sector is hurt by

defense expenditures; while the service industry receives the greatest benefits. But what about the point raised by both Anderson and Bezdek that spending the money in an alternative manner would actually create more jobs as opposed to spending it on defense? According to the results of this analysis, their point seems well taken. An extra one billion dollars for health, education, and highways would increase the number of jobs by about 114,000. A similar increase in military outlays would add only 47,000 jobs. That is a significant difference. Even if the numbers are not taken at face value, a conservative conclusion is that spending for health, education, and highways offers the prospect of greater employment growth than spending for defense.

Does this mean that the federal government should decrease defense expenditures and increase spending for civilian programs? No. Thousands of Americans are presently working on defense-related projects or are directly employed by the DOD. Major defense budget cuts would put many people on the unemployment roles. In addition, military spending is essential to the defense of our country. What this study suggests is that spending on defense solely for the purpose of stimulating employment growth might not be the most effective solution.

In conclusion, defense spending is an important factor in regional growth. States which receive disproportionate amounts of defense dollars, such as California, obviously benefit greatly. For instance, one researcher estimates that about one third of all non-agricultural employees in California have been dependent on continued defense expenditures [Ref. 21: p. 70]. The defense funds are not distributed disproportionately because of any political collusion, but rather because of differences in the states' industrial bases. California receives more defense contracts than other states because it is the foremost producer of aircraft, missiles, and electronics; items which dominate the procurement program. So, to spur employment growth, state officials and politicians would be wise to go after defense dollars either by attracting defense-related businesses or by lobbying for military bases. The concentration of military purchases in a small number of lower job-yielding industries (see Table 10) probably explains why this economic analysis has found that transferring military expenditures to other sectors of the economy creates more jobs.

APPENDIX A
LIST OF SOURCES

1. DOD Expenditures:
   For 1976-1980: Community Services Administration, *Geographic Distribution of Federal Funds in Summary*
   For 1981: U.S. Department of Defense, *Department of Defense Prime Contracts by Region and State*
   For 1982-1985: U.S. Department of Defense, *Atlas State Data Abstract for the United States*
2. State Spending on Welfare, Highways, Education, and Health: U.S. Bureau of Census, *State Government Finance.*
3. Employment and Wage Statistics: U.S. Bureau of Labor Statistics, *Employment and Earnings.*
4. Population: U.S. Bureau of the Census, *Current Population Reports*, Series P-25.
5. Land Area: U.S. Bureau of the Census, *1980 Census of the Population.*
6. Personal Income: U.S. Bureau of Economic Analysis, *Survey of Current Business.*
7. Corporate Income: U.S. Bureau of Economic Analysis, *Survey of Current Business.*
8. Personal Income Tax: U.S. Bureau of the Ceinsus, *State Government Tax Collections.*
9. Corporate Income Tax: U.S. Bureau of the Census, *State Government Tax Collections.*
10. Implicit Price Deflators: U.S. Bureau of Economic Analysis, *Survey of Current Business.*

APPENDIX B

REGRESSION EQUATION AND RESULTS FOR POPULATION

```
     1  0          RUN NAME       FINAL REGRESSION
     2  0          FILE HANDLE FINALDAT/NAME='BASDATFF DATA A'
     3  0          DATA LIST FILE=FINALDAT FREE/
     4  0
     5  0                              YEAR,STATE,PERSINC,POP,MILPAY,CIVPAY,
     6  0                             PROCCON,RDCON,SERVCON,CONSCON,MFGEMP,   FHEH,FWEL,
     7  0                             STHEH,STWEL,PERINCTX,CORINCTX,MANWAGE,
     8  0                             MANINC, CORPPINC,  LNDAREA,RETIREE,TOTEMP,WREMP,
     9  0                             SEREMP,POPLAG,TOTEMPLG,WREMPLG,SEREMPLG,MFGEMPLG,
    10  0                            YR76 TO YR84,SC1 TO SC47
    11  0          VAR LABELS        PERSINC 'PERSONAL INCOME'
    12  0                            MILPAY 'MILITARY PAYROLL'
    13  0                            CIVPAY 'CIVILIAN PAYROLL'
    14  0                            PROCCON 'PROCURMENT CONTRACTS'
    15  0                            RDCON 'R&D CONTRACTS'
    16  0                            SERVCON 'SERVICE CONTRACTS'
    17  0                            CONSCON 'CONSTRUCTION CONTRACTS'
    18  0                            STHEH 'STATE SPENDING (HIGH. EDUCAT. HEALTH)'
    19  0                            STWEL 'STATE SPENDING WELFARE'
    20  0                            PERINCTX 'PERSONAL INCOME TAX'
    21  0                            CORINCTX 'CORPORATE INCOME TAX'
    22  0                            MANWAGE 'AVERAGE MANUFACT. WAGE'
    23  0                            POP   'POPULATION'
    24  0                            TOTEMP 'TOTAL NON-AG EMPLOYMENT'
    25  0                            WREMP 'WHOLESALE-RETAIL TRADE EMP.'
    26  0                            SEREMP 'SERVICE EMPLOYMENT'
    27  0                            MFGEMP  'MANUFACTURING EMPLOYMENT'
    28  0                            FHEH 'FEDERAL SPENDING (HIGH. EDUCAT. HEALTH)'
    29  0                            FWEL 'FEDERAL WELFARE SPENDING'
    30  0                            RETIREE '% POP. OVER 65 YEARS'
    31  0                            POPLAG 'POPULATION LAGGED 1 YR.'
114 DEC 87   FINAL REGRESSION
2
  20:56:57    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
    32  0          COMPUTE          PROCCONS = LAG(PROCCON,1)
    33  0          COMPUTE          EXPROCON = RDCON + SERVCON + CONSCON
    34  0          COMPUTE          CORPINC = CORPPINC*1000
    35  0
    36  0          COMPUTE          DODTOTAL = MILPAY + CIVPAY + PROCCON + RDCON + SERVCON +
    37  0                                      CONSCON
    38  0          COMPUTE          CORTXPY = CORINCTX/CORPINC
    39  0          COMPUTE          INCTXPY = PERINCTX/PERSINC
    40  0          COMPUTE          POPDEN = POP/LNDAREA
    41  0          COMPUTE          PCSTHEH = STHEH/POP
    42  0          COMPUTE          PCSTWEL = STWEL/POP
    43  0          COMPUTE          AJSTHEH = STHEH-FHEH
    44  0          COMPUTE          AJSTWEL = STWEL-FWEL
    45  0          COMPUTE          DELTEMP =(TOTEMP-TOTEMPLG)/TOTEMPLG
    46  0          COMPUTE          PCPERINC = PERSINC/POP
    47  0          COMPUTE          PERSPAY = MILPAY + CIVPAY
    48  0          COMPUTE          DODCONS = CONSCON + PROCCON + SERVCON + RDCON
    49  0          VAR LABELS       DODTOTAL 'TOTAL DOD EXPENDITURES'
    50  0                           DODCONS 'TOTAL DOD CONTRACTS'
    51  0                           PERSPAY 'DOD MILITARY AND CIVILIAN PAYROLL'
    52  0                           INCTXPY 'PERSONAL INCOME TAX PROXY'
    53  0                           CORPINC 'CORPORATE INCOME'
    54  0                           CORTXPY 'CORPORATE INCOME TAX PROXY'
    55  0                           POPDEN 'POPULATION DENSITY'
    56  0                           PCPERINC 'PERCAPITA PERSONAL INCOME'
    57  0                           PCSTHEH 'PERCAPITA STATE SPENDING HEALTH,HIWAY,EDUC.'
    58  0                           PCSTWEL 'PERCAPITA STATE SPENDING WELFARE'
```

```
    59  0          REGRESSION VARIABLES=(COLLECT)/
    60  0                     CRITERIA=TOL(.0001)/
    61  0                     DEPENDENT=POP/ENTER POPLAG MANWAGE
    62  0                     INCTXPY POPDEN DELTEMP PCSTWEL PCSTHEH PCPERINC/
    63  0                     SAVE PRED(POPHAT)
0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
-LISTWISE DELETION OF MISSING DATA
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP    POPULATION

  VARIABLE(S) ENTERED ON STEP NUMBER  1..    PCPERINC  PERCAPITA PERSONAL INCOME
                                             2..    DELTEMP
                                             3..    PCSTHEH   PERCAPITA STATE SPENDING HEALTH,HIWAY,E
                                             4..    INCTXPY   PERSONAL INCOME TAX PROXY
                                             5..    POPLAG    POPULATION LAGGED 1 YR.
                                             6..    MANWAGE   AVERAGE MANUFACT. WAGE
                                             7..    POPDEN    POPULATION DENSITY
                                             8..    PCSTWEL   PERCAPITA STATE SPENDING WELFARE
0
  MULTIPLE R           .99988          ANALYSIS OF VARIANCE
  R SQUARE             .99976                          DF      SUM OF SQUARES      MEAN SQUARE
  ADJUSTED R SQUARE    .99975          REGRESSION       8          10899.52028       1362.44004
  STANDARD ERROR       .07474          RESIDUAL       471              2.63080           .00559

                                                      F =  243921.49422       SIGNIF F =  .0000
------------------- VARIABLES IN THE EQUATION ------------------
0VARIABLE              B         SE B       BETA          T  SIG T

  PCPERINC         .013504     .006449    .002048      2.094  .0368
  DELTEMP          .529516     .106543    .003695      4.970  .0000
  PCSTHEH          .206886     .063041    .002680      3.282  .0011
  INCTXPY        -1.174916     .372290   -.002612     -3.156  .0017
  POPLAG          1.016839  8.8786E-04   1.003906   1145.274  .0000
  MANWAGE         -.033113     .007356   -.003947     -4.502  .0000
  POPDEN          -.066552     .021037   -.003128     -3.164  .0017
  PCSTWEL         -.591638     .140352   -.004432     -4.215  .0000
  (CONSTANT)       .039910     .033944                1.176  .2403
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
4
  20:57:05    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP    POPULATION

0RESIDUALS STATISTICS:

                              MIN          MAX      MEAN  STD DEV    N

  *PRED              .4569   26.1734    4.7106    4.7702  480
  *RESID           -.3753     .4667     .0000     .0741  480
  *ZPRED           -.8917    4.4994     .0000    1.0000  480
  *ZRESID         -5.0223    6.2444     .0000     .9916  480
0TOTAL CASES =       480
-
                                                * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

APPENDIX C
LISTING OF DUMMY VARIABLES

STATE	VARIABLE	YEAR	VARIABLE
Alabama	SC1	1976	YR76
Arizona	SC2	1977	YR77
Arkansas	SC3	1978	YR78
California	SC4	1979	YR79
Colorado	SC5	1980	YR80
Conneticut	SC6	1981	YR81
Delaware	SC7	1982	YR82
Florida	SC8	1983	YR83
Georgia	SC9	1984	YR84
Idaho	SC10		
Illinois	SC11		
Indiana	SC12		
Iowa	SC13		
Kansas	SC14		
Kentucky	SC15		
Louisiana	SC16		
Maine	SC17		
Maryland	SC18		
Massachusetts	SC19		
Michigan	SC20		
Minnesota	SC21		
Mississippi	SC22		
Missouri	SC23		
Montana	SC24		
Nebraska	SC25		
Nevada	SC26		
New Hampshire	SC27		
New Jersey	SC28		
New Mexico	SC29		
New York	SC30		
North Carolina	SC31		
North Dakota	SC32		
Ohio	SC33		
Oklahoma	SC34		
Oregon	SC35		
Pennsylvania	SC36		
Rhode Island	SC37		
South Carolina	SC38		
South Dakota	SC39		
Tennessee	SC40		

Texas	SC41
Utah	SC42
Vermont	SC43
Virginia	SC44
Washington	SC45
West Virginia	SC46
Wisconsin	SC47

APPENDIX D
PEARSON CORRELATION COEFFICIENTS

PEARSON CORRELATION COEFFICIENTS

	TOTEMP	MFGEMP	WREMP	SEREMP	POP	PROCCON	SERVCON	RDCON	CONSCON	MILPAY	CIVPAY
TOTEMP	1.0000	.9475	.9950	.9126	.9966	.8186	.8032	.7063	.5754	.6468	.7032
	(0)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000
MFGEMP	.9475	1.0000	.9248	.8356	.9445	.7168	.6673	.6046	.4684	.5275	.6257
	(480)	(0)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000
WREMP	.9950	.9248	1.0000	.9069	.9923	.8274	.8010	.7201	.5992	.6739	.7132
	(480)	(480)	(0)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000
SEREMP	.9126	.8356	.9069	1.0000	.9054	.7763	.8150	.6815	.5378	.6255	.6836
	(480)	(480)	(480)	(0)	(480)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000
POP	.9966	.9445	.9923	.9054	1.0000	.8049	.7952	.6994	.5823	.6552	.7105
	(480)	(480)	(480)	(480)	(0)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000
PROCCON	.8186	.7168	.8274	.7763	.8049	1.0000	.8579	.8532	.6441	.6883	.7002
	(480)	(480)	(480)	(480)	(480)	(0)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .	P= .000	P= .000	P= .000	P= .000	P= .000
SERVCON	.8032	.6673	.8010	.8150	.7952	.8579	1.0000	.8255	.7004	.7925	.8240
	(480)	(480)	(480)	(480)	(480)	(480)	(0)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .	P= .000	P= .000	P= .000	P= .000
RDCON	.7063	.6046	.7201	.6815	.6994	.8532	.8255	1.0000	.7042	.7149	.7396
	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(0)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .	P= .000	P= .000	P= .000
CONSCON	.5754	.4684	.5992	.5378	.5823	.6441	.7004	.7042	1.0000	.8115	.7684
	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(0)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .	P= .000	P= .000
MILPAY	.6468	.5275	.6739	.6255	.6552	.6883	.7925	.7149	.8115	1.0000	.8655
	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(0)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .	P= .000
CIVPAY	.7032	.6257	.7132	.6836	.7105	.7002	.8240	.7396	.7684	.8655	1.0000
	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(0)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .
STHEH	.9827	.9220	.9770	.8935	.9856	.8145	.8196	.7289	.6256	.6879	.7241
	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000
STWEL	.9215	.8816	.8987	.8658	.9149	.7990	.8019	.7673	.5220	.5368	.6315
	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000
MANWAGE	.2185	.2378	.2230	.1844	.2173	.1345	.0305	.1380	-.0292	-.1050	.0261
	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .002	P= .253	P= .001	P= .262	P= .011	P= .285
CORTXPY	.2276	.3089	.1986	.2107	.2198	.1926	.1830	.2161	.0181	.0104	.0761
	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .000	P= .346	P= .410	P= .048

0(COEFFICIENT / (CASES) / 1-TAILED SIG) " . " IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED
114 DEC 87 FINAL REGRESSION
7
 20:06:22 NAVAL POSTGRADUATE SCHOOL IBM 3033AP VM/SP CMS

0- - - - - - - - - - - - - - - P E A R S O N C O R R E L A T I O N C O E F F I C I E N T S - - - - - - - -
0

	STHEH	STWEL	MANWAGE	CORTXPY
TOTEMP	.9827	.9215	.2185	.2276
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000
MFGEMP	.9220	.8816	.2378	.3089
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000
MREMP	.9770	.8987	.2230	.1986
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000
SEREMP	.8935	.8658	.1844	.2107
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000
POP	.9856	.9149	.2173	.2198
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .000	P= .000
PROCCON	.8145	.7990	.1345	.1926
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .002	P= .000
SERVCON	.8196	.8019	.0305	.1830
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .253	P= .000
RDCON	.7289	.7673	.1380	.2161
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .001	P= .000
CONSCON	.6256	.5220	-.0292	.0181
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .262	P= .346
MILPAY	.6879	.5368	-.1050	.0104
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .011	P= .410
CIVPAY	.7241	.6315	.0261	.0761
	(480)	(480)	(480)	(480)
	P= .000	P= .000	P= .285	P= .048

0(COEFFICIENT / (CASES) / 1-TAILED SIG) " . " IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED
114 DEC 87 FINAL REGRESSION
8
20:06:22 NAVAL POSTGRADUATE SCHOOL IBM 3033AP VM/SP CMS

0- - - - - - - - - - - - - - - P E A R S O N C O R R E L A T I O N C O E F F I C I E N T S - - - - - - - -
0

	STHEH	STWEL	MANWAGE	CORTXPY
STHEH	1.0000	.9282	.2417	.2255
	(0)	(480)	(480)	(480)
	P= .	P= .000	P= .000	P= .000
STWEL	.9282	1.0000	.2519	.3744
	(480)	(0)	(480)	(480)
	P= .000	P= .	P= .000	P= .000
MANWAGE	.2417	.2519	1.0000	-.0162
	(480)	(480)	(0)	(480)

```
          P= .000  P= .000  P= .     P= .361

CORTXPY     .2255    .3744    -.0162   1.0000
          (  480)  (  480)  (  480)  (    0)
          P= .000  P= .000  P= .361  P= .

O(COEFFICIENT / (CASES) / 1-TAILED SIG)          " . " IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED
```

APPENDIX E

REGRESSION EQUATION AND RESULTS USING DODTOTAL

```
     1  0          RUN NAME       FINAL REGRESSION
     2  0          FILE HANDLE FINALDAT/NAME='BASDATFF DATA A'
     3  0          DATA LIST FILE=FINALDAT FREE/
     4  0
     5  0                              YEAR,STATE,PERSINC,POP,MILPAY,CIVPAY,
     6  0                            PROCCON,RDCON,SERVCON,CONSCON,MFGEMP,   FHEH,FWEL,
     7  0                            STHEH,STWEL,PERINCTX,CORINCTX,MANWAGE,
     8  0                            MANINC, CORPPINC,  LNDAREA,RETIREE,TOTEMP,WREMP,
     9  0                            SEREMP,POPLAG,TOTEMPLG,WREMPLG,SEREMPLG,MFGEMPLG,
    10  0                           YR76 TO YR84,SC1 TO SC47
    11  0          VAR LABELS       PERSINC 'PERSONAL INCOME'
    12  0                           MILPAY 'MILITARY PAYROLL'
    13  0                           CIVPAY 'CIVILIAN PAYROLL'
    14  0                           PROCCON 'PROCURMENT CONTRACTS'
    15  0                           RDCON 'R&D CONTRACTS'
    16  0                           SERVCON 'SERVICE CONTRACTS'
    17  0                           CONSCON 'CONSTRUCTION CONTRACTS'
    18  0                           STHEH 'STATE SPENDING (HIGH. EDUCAT. HEALTH)'
    19  0                           STWEL 'STATE SPENDING WELFARE'
    20  0                           PERINCTX 'PERSONAL INCOME TAX'
    21  0                           CORINCTX 'CORPORATE INCOME TAX'
    22  0                           MANWAGE 'AVERAGE MANUFACT. WAGE'
    23  0                           POP  'POPULATION'
    24  0                           TOTEMP 'TOTAL NON-AG EMPLOYMENT'
    25  0                           WREMP 'WHOLESALE-RETAIL TRADE EMP.'
    26  0                           SEREMP 'SERVICE EMPLOYMENT'
    27  0                           MFGEMP  'MANUFACTURING EMPLOYMENT'
    28  0                           FHEH 'FEDERAL SPENDING (HIGH. EDUCAT. HEALTH)'
    29  0                           FWEL 'FEDERAL WELFARE SPENDING'
    30  0                           RETIREE '% POP. OVER 65 YEARS'
    31  0                           POPLAG 'POPULATION LAGGED 1 YR.'
114 DEC 87   FINAL REGRESSION
2
  20:56:57   NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
    32  0          COMPUTE          PROCCONS = LAG(PROCCON,1)
    33  0          COMPUTE          EXPROCON = RDCON + SERVCON + CONSCON
    34  0          COMPUTE          CORPINC = CORPPINC*1000
    35  0
    36  0          COMPUTE          DODTOTAL = MILPAY + CIVPAY + PROCCON + RDCON + SERVCON +
    37  0                                      CONSCON
    38  0          COMPUTE          CORTXPY = CORINCTX/CORPINC
    39  0          COMPUTE          INCTXPY = PERINCTX/PERSINC
    40  0          COMPUTE          POPDEN = POP/LNDAREA
    41  0          COMPUTE          PCSTHEH = STHEH/POP
    42  0          COMPUTE          PCSTWEL = STWEL/POP
    43  0          COMPUTE          AJSTHEH = STHEH-FHEH
    44  0          COMPUTE          AJSTWEL = STWEL-FWEL
    45  0          COMPUTE          DELTEMP =(TOTEMP-TOTEMPLG)/TOTEMPLG
    46  0          COMPUTE          PCPERINC = PERSINC/POP
    47  0          COMPUTE          PERSPAY = MILPAY + CIVPAY
    48  0          COMPUTE          DODCONS = CONSCON + PROCCON + SERVCON + RDCON
    49  0          VAR LABELS       DODTOTAL 'TOTAL DOD EXPENDITURES'
    50  0                           DODCONS 'TOTAL DOD CONTRACTS'
    51  0                           PERSPAY 'DOD MILITARY AND CIVILIAN PAYROLL'
    52  0                           INCTXPY 'PERSONAL INCOME TAX PROXY'
    53  0                           CORPINC 'CORPORATE INCOME'
    54  0                           CORTXPY 'CORPORATE INCOME TAX PROXY'
    55  0                           POPDEN 'POPULATION DENSITY'
    56  0                           PCPERINC 'PERCAPITA PERSONAL INCOME'
    57  0                           PCSTHEH 'PERCAPITA STATE SPENDING HEALTH,HIWAY,EDUC.'
    58  0                           PCSTWEL 'PERCAPITA STATE SPENDING WELFARE'
```

```
    59  0          REGRESSION VARIABLES=(COLLECT)/
    60  0                     CRITERIA=TOL(.0001)/
    61  0                     DEPENDENT=POP/ENTER POPLAG MANWAGE
    62  0                     INCTXPY POPDEN DELTEMP PCSTWEL PCSTHEH PCPERINC/
    63  0                     SAVE PRED(POPHAT)
0                                  * * * *   M U L T I P L E   R E G R E S S I O N   * * * *
-LISTWISE DELETION OF MISSING DATA
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP   POPULATION
 VARIABLE(S) ENTERED ON STEP NUMBER  1..    PCPERINC  PERCAPITA PERSONAL INCOME
                                                      2..    DELTEMP
                                                      3..    PCSTHEH   PERCAPITA STATE SPENDING HEALTH,HIWAY,EI
                                                      4..    INCTXPY   PERSONAL INCOME TAX PROXY
                                                      5..    POPLAG    POPULATION LAGGED 1 YR.
                                                      6..    MANWAGE   AVERAGE MANUFACT. WAGE
                                                      7..    POPDEN    POPULATION DENSITY
                                                      8..    PCSTWEL   PERCAPITA STATE SPENDING WELFARE
0
 MULTIPLE R           .99988         ANALYSIS OF VARIANCE
 R SQUARE             .99976                             DF      SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .99975         REGRESSION           8         10899.52028       1362.44004
 STANDARD ERROR       .07474         RESIDUAL           471             2.63080           .00559
                                                  F =  243921.49422       SIGNIF F =  .0000
------------------- VARIABLES IN THE EQUATION ------------------
0VARIABLE              B          SE B        BETA          T  SIG T
 PCPERINC         .013504     .006449     .002048      2.094  .0368
 DELTEMP          .529516     .106543     .003695      4.970  .0000
 PCSTHEH          .206886     .063041     .002680      3.282  .0011
 INCTXPY        -1.174916     .372290    -.002612     -3.156  .0017
 POPLAG          1.016839  8.8786E-04    1.003906   1145.274  .0000
 MANWAGE         -.033113     .007356    -.003947     -4.502  .0000
 POPDEN          -.066552     .021037    -.003128     -3.164  .0017
 PCSTWEL         -.591638     .140352    -.004432     -4.215  .0000
 (CONSTANT)       .039910     .033944                  1.176  .2403
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87    FINAL REGRESSION
4
 20:57:05    NAVAL POSTGRADUATE SCHOOL     IBM 3033AP       VM/SP CMS
0                                  * * * *   M U L T I P L E   R E G R E S S I O N   * * * *
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP   POPULATION
0RESIDUALS STATISTICS:
                              MIN          MAX      MEAN   STD DEV    N
 *PRED            .4569     26.1734    4.7106    4.7702   480
 *RESID          -.3753       .4667     .0000     .0741   480
 *ZPRED          -.8917      4.4994     .0000    1.0000   480
 *ZRESID        -5.0223      6.2444     .0000     .9916   480
0TOTAL CASES =       480
-
                                                    * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
    64  0          REGRESSION VARIABLES=(COLLECT)/
    65  0                     CRITERIA=TOL(.0001)/
    66  0                     DEPENDENT= TOTEMP MFGEMP WREMP SEREMP/ENTER
    67  0                     POPHAT DODTOTAL
    68  0                     STHEH STWEL  MANWAGE CORTXPY     YR76 TO YR84
    69  0                     SC1 TO SC47/

0                                  * * * *   M U L T I P L E   R E G R E S S I O N   * * * *
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   TOTEMP   TOTAL NON-AG EMPLOYMENT
0
 MULTIPLE R           .99915         ANALYSIS OF VARIANCE
 R SQUARE             .99831                             DF      SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .99806         REGRESSION          62          1776.08484         28.64653
 STANDARD ERROR       .08492         RESIDUAL           417             3.00690           .00721
                                                  F =     3972.73581       SIGNIF F =  .0000
114 DEC 87    FINAL REGRESSION
9
```

20:57:09 NAVAL POSTGRADUATE SCHOOL IBM 3033AP VM/SP CMS

0 * * * * MULTIPLE REGRESSION * * * *

OEQUATION NUMBER 1 DEPENDENT VARIABLE.. TOTEMP TOTAL NON-AG EMPLOYMENT

---------- VARIABLES IN THE EQUATION ----------

OVARIABLE	B	SE B	BETA	T	SIG T
SC47	-.170839	.091683	-.012674	-1.863	.0631
YR84	-.029011	.019050	-.004521	-1.523	.1286
STHEH	.114890	.035911	.082949	3.199	.0015
SC19	-.008171	.108386	-6.062E-04	-.075	.9399
SC18	-.253265	.068913	-.018789	-3.675	.0003
SC16	-.351723	.075226	-.026093	-4.676	.0000
SC1	-.377922	.072196	-.028037	-5.235	.0000
SC12	-.266140	.092933	-.019744	-2.864	.0044
SC21	-.099320	.078173	-.007368	-1.271	.2046
SC15	-.397687	.068942	-.029503	-5.768	.0000
SC9	-.252560	.097527	-.018737	-2.590	.0099
SC23	-.261429	.077526	-.019395	-3.372	.0008
SC40	-.225593	.088863	-.016736	-2.539	.0115
SC45	-.367922	.074946	-.027295	-4.909	.0000
SC44	-.387473	.085946	-.028746	-4.508	.0000
SC13	-.186764	.064981	-.013856	-2.874	.0043
SC28	-.189338	.128124	-.014046	-1.478	.1402
SC34	-.227884	.057691	-.016906	-3.950	.0001
YR79	.007889	.018369	.001229	.429	.6678
SC38	-.174152	.074736	-.012920	-2.330	.0203
SC5	-.053359	.054790	-.003959	-.974	.3307
SC31	-.248177	.109393	-.018412	-2.269	.0238
SC2	-.178409	.054824	-.013236	-3.254	.0012
SC35	-.076060	.064942	-.005643	-1.171	.2422
SC22	-.295356	.070161	-.021912	-4.210	.0000
SC6	.010501	.066618	7.790E-04	.158	.8748
SC14	-.099737	.056387	-.007399	-1.769	.0777
YR82	-.070158	.017647	-.010933	-3.976	.0001
SC46	-.196484	.048689	-.014577	-4.036	.0001
SC8	-.702276	.160012	-.052100	-4.389	.0000
SC3	-.210544	.068030	-.015620	-3.095	.0021
SC29	-.113671	.056328	-.008433	-2.018	.0442
SC42	-.068786	.043598	-.005103	-1.578	.1154
SC20	-.780885	.175028	-.057932	-4.461	.0000
YR76	-.148390	.019414	-.023123	-7.644	.0000
SC25	-.030250	.046099	-.002244	-.656	.5121
SC33	-.513371	.181777	-.038086	-2.824	.0050
SC17	-.025955	.054496	-.001926	-.476	.6341
SC11	-.426567	.201778	-.031646	-2.114	.0351
YR83	-.091024	.019055	-.014184	-4.777	.0000
SC10	-.022415	.047187	-.001663	-.475	.6350
SC36	-.701938	.207572	-.052075	-3.382	.0008
SC32	-.008870	.054498	-6.580E-04	-.163	.8708
SC37	.058260	.061736	.004322	.944	.3459
YR81	-.015936	.017756	-.002483	-.897	.3700
SC24	-.002289	.060775	-1.698E-04	-.038	.9700
SC26	.059236	.038800	.004395	1.527	.1276
SC41	-.669412	.214107	-.049662	-3.127	.0019
YR80	-.008092	.018295	-.001261	-.442	.6585
SC7	.056985	.048171	.004228	1.183	.2375
SC39	-.026789	.047808	-.001987	-.560	.5755
YR78	-.044191	.018709	-.006886	-2.362	.0186
SC27	.042665	.059767	.003165	.714	.4757
SC30	-1.071796	.313247	-.079514	-3.422	.0007
YR77	-.110442	.019561	-.017210	-5.646	.0000
SC43	.040099	.052692	.002975	.761	.4471
CORTXPY	-1.993196	2.925704	-.004104	-.681	.4961
DODTOTAL	.047419	.015297	.047376	3.100	.0021
MANAGE	.004272	.044455	.001261	.096	.9235
SC4	-1.779119	.372523	-.131988	-4.776	.0000
STWEL	.174997	.060057	.067940	2.914	.0038
POPHAT	.393013	.021358	.972773	18.401	.0000
(CONSTANT)	-.014884	.185245		-.080	.9360

-END BLOCK NUMBER 1 ALL REQUESTED VARIABLES ENTERED.

114 DEC 87 FINAL REGRESSION
11
 20:57:10 NAVAL POSTGRADUATE SCHOOL IBM 3033AP VM/SP CMS

0 **** MULTIPLE REGRESSION ****
0EQUATION NUMBER 2 DEPENDENT VARIABLE.. MFGEMP MANUFACTURING EMPLOYMENT
0

MULTIPLE R	.99668	ANALYSIS OF VARIANCE			
R SQUARE	.99337		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	.99238	REGRESSION	62	85.93826	1.38610
STANDARD ERROR	.03710	RESIDUAL	417	.57401	.00138

F = 1006.96690 SIGNIF F = .0000

114 DEC 87 FINAL REGRESSION
14
 20:57:11 NAVAL POSTGRADUATE SCHOOL IBM 3033AP VM/SP CMS

0 **** MULTIPLE REGRESSION ****
0EQUATION NUMBER 2 DEPENDENT VARIABLE.. MFGEMP MANUFACTURING EMPLOYMENT

---------- VARIABLES IN THE EQUATION ----------

0VARIABLE	B	SE B	BETA	T	SIG T
SC47	.308118	.040058	.103659	7.692	.0000
YR84	.018701	.008323	.013215	2.247	.0252
STHEH	.114015	.015690	.373296	7.267	.0000
SC19	.475926	.047356	.160114	10.050	.0000
SC18	.031365	.030109	.010552	1.042	.2981
SC16	-.040748	.032867	-.013709	-1.240	.2158
SC1	.151073	.031544	.050825	4.789	.0000
SC12	.354766	.040604	.119353	8.737	.0000
SC21	.128925	.034155	.043374	3.775	.0002
SC15	.076909	.030122	.025874	2.553	.0110
SC9	.261171	.042611	.087865	6.129	.0000
SC23	.231846	.033873	.077999	6.845	.0000
SC40	.289395	.038826	.097360	7.454	.0000
SC45	.033198	.032745	.011169	1.014	.3113
SC44	.170950	.037551	.057512	4.552	.0000
SC13	.054863	.028391	.018457	1.932	.0540
SC28	.428870	.055980	.144283	7.661	.0000
SC34	.026906	.025206	.009052	1.067	.2864
YR79	.061777	.008026	.043654	7.697	.0000
SC38	.243665	.032653	.081975	7.462	.0000
SC5	.031128	.023939	.010472	1.300	.1942
SC31	.484073	.047795	.162855	10.128	.0000
SC2	.003364	.023953	.001132	.140	.8884
SC35	.066692	.028374	.022437	2.350	.0192
SC22	.131672	.030654	.044298	4.295	.0000
SC6	.334940	.029106	.112682	11.507	.0000
SC14	.081048	.024637	.027267	3.290	.0011
YR82	.018730	.007710	.013235	2.429	.0156
SC46	-.001400	.021273	-4.709E-04	-.066	.9476
SC8	-.060002	.069912	-.020186	-.858	.3912
SC3	.129779	.029724	.043661	4.366	.0000
SC29	-.016083	.024611	-.005411	-.653	.5138
SC42	.026140	.019049	.008794	1.372	.1707
SC20	.562127	.076473	.189114	7.351	.0000
YR76	.023641	.008482	.016706	2.787	.0056
SC25	.037483	.020142	.012610	1.861	.0635
SC33	.662895	.079421	.223015	8.347	.0000
SC17	.107308	.023810	.036101	4.507	.0000
SC11	.560081	.088160	.188426	6.353	.0000
YR83	.011744	.008325	.008299	1.411	.1591
SC10	.025794	.020617	.008678	1.251	.2116
SC36	.706978	.090692	.237846	7.795	.0000
SC32	.013206	.023811	.004443	.555	.5795
SC37	.140102	.026974	.047134	5.194	.0000
YR81	.045952	.007758	.032472	5.923	.0000
SC24	-.010291	.026554	-.003462	-.388	.6985
SC26	-.005302	.016952	-.001784	-.313	.7546
SC41	.185029	.093547	.062249	1.978	.0486
YR80	.040639	.007993	.028718	5.084	.0000
SC7	.058456	.021047	.019666	2.777	.0057

```
 SC39            .033091     .020888     .011133     1.584   .1139
 YR78            .063851     .008174     .045120     7.811   .0000
 SC27            .120978     .026113     .040700     4.633   .0000
 SC30            .597411     .136863     .200984     4.365   .0000
 YR77            .047937     .008547     .033875     5.609   .0000
 SC43            .068664     .023022     .023100     2.983   .0030
 CORTXPY        -.205652    1.278289    -.001920     -.161   .8723
 DODTOTAL       -.017632     .006684    -.079885    -2.638   .0086
 MANWAGE         .024583     .019423     .032893     1.266   .2063
 SC4             .911174     .162762     .306542     5.598   .0000
 STWEL          -.123297     .026240    -.217075    -4.699   .0000
 POPHAT          .037230     .009332     .417890     3.990   .0001
 (CONSTANT)     -.166404     .080937                -2.056   .0404
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
16
 20:57:11    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP      VM/SP CMS
0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
OEQUATION NUMBER 3    DEPENDENT VARIABLE..   WREMP   WHOLESALE-RETAIL TRADE EMP.
0
 MULTIPLE R          .99902          ANALYSIS OF VARIANCE
 R SQUARE            .99804                          DF       SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE   .99775          REGRESSION          62          92.87582          1.49800
 STANDARD ERROR      .02092          RESIDUAL           417            .18245           .00044

                                                  F =    3423.72799       SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
19
 20:57:12    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP      VM/SP CMS
0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
OEQUATION NUMBER 3    DEPENDENT VARIABLE..   WREMP   WHOLESALE-RETAIL TRADE EMP.
------------------- VARIABLES IN THE EQUATION ------------------
OVARIABLE              B         SE B        BETA         T   SIG T

 SC47           -.115300     .022584    -.037401    -5.105   .0000
 YR84           -.011889     .004693    -.008100    -2.534   .0117
 STHEH           .004734     .008846     .014945      .535   .5928
 SC19           -.127683     .026699    -.041417    -4.782   .0000
 SC18           -.106131     .016975    -.034426    -6.252   .0000
 SC16           -.135711     .018530    -.044021    -7.324   .0000
 SC1            -.174189     .017784    -.056503    -9.795   .0000
 SC12           -.161676     .022892    -.052444    -7.062   .0000
 SC21           -.043802     .019256    -.014209    -2.275   .0234
 SC15           -.153534     .016982    -.049803    -9.041   .0000
 SC9            -.129363     .024024    -.041962    -5.385   .0000
 SC23           -.132374     .019097    -.042939    -6.932   .0000
 SC40           -.137764     .021889    -.044687    -6.294   .0000
 SC45           -.123043     .018461    -.039912    -6.665   .0000
 SC44           -.215392     .021171    -.069868   -10.174   .0000
 SC13           -.055697     .016007    -.018067    -3.480   .0006
 SC28           -.178933     .031561    -.058042    -5.669   .0000
 SC34           -.085353     .014211    -.027687    -6.006   .0000
 YR79           -.013309     .004525    -.009068    -2.941   .0035
 SC38           -.124221     .018410    -.040294    -6.748   .0000
 SC5            -.034697     .013496    -.011255    -2.571   .0105
 SC31           -.204397     .026947    -.066302    -7.585   .0000
 SC2            -.064909     .013505    -.021055    -4.806   .0000
 SC35           -.037093     .015997    -.012032    -2.319   .0209
 SC22           -.124485     .017283    -.040380    -7.203   .0000
 SC6            -.080527     .016410    -.026121    -4.907   .0000
 SC14           -.046230     .013890    -.014996    -3.328   .0010
 YR82           -.030594     .004347    -.020845    -7.038   .0000
 SC46           -.078786     .011993    -.025556    -6.569   .0000
 SC8            -.200284     .039416    -.064968    -5.081   .0000
 SC3            -.085791     .016758    -.027829    -5.119   .0000
 SC29           -.036277     .013875    -.011767    -2.615   .0093
 SC42           -.026327     .010739    -.008540    -2.451   .0146
 SC20           -.396504     .043114    -.128617    -9.197   .0000
 YR76           -.045754     .004782    -.031174    -9.568   .0000
 SC25           -.006709     .011356    -.002176     -.591   .5550
```

```
 SC33          -.331222     .044777   -.107441    -7.397  .0000
 SC17          -.021843     .013424   -.007085    -1.627  .1045
 SC11          -.266076     .049704   -.086309    -5.353  .0000
 YR83          -.030462     .004694   -.020755    -6.490  .0000
 SC10          -.007907     .011624   -.002565     -.680  .4967
 SC36          -.456007     .051131   -.147918    -8.918  .0000
 SC32           .004573     .013424    .001483     .341   .7336
 SC37          -.002795     .015207 -9.066E-04     -.184  .8543
 YR81          -.021750     .004374   -.014819    -4.973  .0000
 SC24       -5.26486E-04    .014971 -1.708E-04     -.035  .9720
 SC26          -.002621     .009557 -8.501E-04     -.274  .7841
 SC41          -.287940     .052741   -.093401    -5.460  .0000
 YR80          -.017929     .004506   -.012216    -3.979  .0001
 SC7            .007583     .011866    .002460     .639   .5231
 SC39           .001171     .011776  3.799E-04     .099   .9208
 YR78          -.026738     .004609   -.018218    -5.802  .0000
 SC27          -.002117     .014722 -6.868E-04     -.144  .8857
 SC30          -.735606     .077162   -.238614    -9.533  .0000
 YR77          -.039644     .004818   -.027011    -8.227  .0000
 SC43           .005355     .012980    .001737     .413   .6801
 CORTXPY       -.143053     .720684   -.001288     -.198  .8428
 DODTOTAL       .015707     .003768    .068615    4.168  .0000
 MANWAGE        .004267     .010951    .005505     .390   .6970
 SC4           -.827183     .091763   -.268320    -9.014  .0000
 STWEL          .053182     .014794    .090279    3.595  .0004
 POPHAT         .111404     .005261   1.205662   21.175  .0000
 (CONSTANT)    -.013057     .045631               -.286  .7749
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
21
 20:57:12    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP      VM/SP CMS

0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
OEQUATION NUMBER 4    DEPENDENT VARIABLE..   SEREMP   SERVICE EMPLOYMENT
0
 MULTIPLE R           .93328          ANALYSIS OF VARIANCE
 R SQUARE             .87102                          DF      SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .85184          REGRESSION      62          90.74198          1.46358
 STANDARD ERROR       .17951          RESIDUAL       417          13.43695           .03222

                                                     F =      45.42050       SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
24
 20:57:14    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP      VM/SP CMS

0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
OEQUATION NUMBER 4    DEPENDENT VARIABLE..   SEREMP   SERVICE EMPLOYMENT
------------------- VARIABLES IN THE EQUATION -----------------
OVARIABLE              B        SE B       BETA         T  SIG T

 SC47          -.105590     .193813   -.032371     -.545  .5862
 YR84          -.023869     .040271   -.015370     -.593  .5537
 STHEH         -.105488     .075913   -.314733    -1.390  .1654
 SC19          -.211786     .229122   -.064928     -.924  .3558
 SC18          -.153625     .145678   -.047098    -1.055  .2922
 SC16          -.113281     .159022   -.034729     -.712  .4766
 SC1           -.184073     .152617   -.056433    -1.206  .2285
 SC12          -.200435     .196455   -.061449    -1.020  .3082
 SC21          -.007193     .165252   -.002205     -.044  .9653
 SC15          -.121753     .145740   -.037327     -.835  .4040
 SC9           -.274174     .206166   -.084055    -1.330  .1843
 SC23          -.275523     .163886   -.084469    -1.681  .0935
 SC40          -.163801     .187850   -.050218     -.872  .3837
 SC45          -.161873     .158430   -.049627    -1.022  .3075
 SC44           .008989     .181684    .002756     .049   .9606
 SC13          -.002671     .137366 -8.188E-04     -.019  .9845
 SC28          -.252446     .270846   -.077394     -.932  .3518
 SC34          -.117124     .121955   -.035907     -.960  .3374
 YR79          -.021942     .038832   -.014129     -.565  .5723
 SC38          -.155103     .157987   -.047578     -.982  .3265
 SC5           -.041668     .115823   -.012775     -.360  .7192
 SC31          -.255980     .231249   -.078477    -1.107  .2690
```

SC2	-.030738	.115894	-.009423	-.265	.7910
SC35	.011771	.137283	.003609	.086	.9317
SC22	-.179791	.148315	-.055120	-1.212	.2261
SC6	-.164469	.140825	-.050422	-1.168	.2435
SC14	-.057159	.119199	-.017524	-.480	.6318
YR82	.049845	.037305	.032098	1.336	.1822
SC46	-.022989	.102925	-.007048	-.223	.8234
SC8	-.241897	.338255	-.074160	-.715	.4749
SC3	-.101701	.143812	-.031179	-.707	.4798
SC29	-.015696	.119073	-.004812	-.132	.8952
SC42	-.018230	.092163	-.005589	-.198	.8433
SC20	-.400948	.369997	-.122921	-1.084	.2791
YR76	-.058580	.041039	-.037722	-1.427	.1542
SC25	-.008796	.097451	-.002697	-.090	.9281
SC33	-.358826	.384265	-.110008	-.934	.3509
SC17	-.040992	.115200	-.012567	-.356	.7221
SC11	-.363191	.426544	-.111346	-.851	.3950
YR83	-.041766	.040280	-.026895	-1.037	.3004
SC10	.035025	.099750	.010738	.351	.7257
SC36	-.463240	.438792	-.142018	-1.056	.2917
SC32	.036874	.115206	.011305	.320	.7491
SC37	-.008259	.130507	-.002532	-.063	.9496
YR81	-.025489	.037536	-.016413	-.679	.4975
SC24	.078862	.128475	.024177	.614	.5397
SC26	.099815	.082020	.030601	1.217	.2243
SC41	-.644166	.452609	-.197486	-1.423	.1554
YR80	-.012062	.038674	-.007767	-.312	.7553
SC7	.060817	.101830	.018645	.597	.5507
SC39	-.023164	.101063	-.007101	-.229	.8188
YR78	-.054533	.039550	-.035117	-1.379	.1687
SC27	-9.34241E-04	.126343	-2.864E-04	-.007	.9941
SC30	-.688431	.662183	-.211056	-1.040	.2991
YR77	-.067451	.041351	-.043435	-1.631	.1036
SC43	.026265	.111387	.008052	.236	.8137
CORTXPY	-5.075129	6.184740	-.043188	-.821	.4123
DODTOTAL	.079211	.032337	.327045	2.450	.0147
MANWAGE	-.037311	.093975	-.045494	-.397	.6916
SC4	-1.583857	.787488	-.485573	-2.011	.0449
STWEL	.270104	.126957	.433350	2.128	.0340
POPHAT	.108257	.045149	1.107311	2.398	.0169
(CONSTANT)	.161295	.391596		.412	.6806

-END BLOCK NUMBER 1 ALL REQUESTED VARIABLES ENTERED.

APPENDIX F

REGRESSION EQUATION AND RESULTS USING DODCONS AND PERSPAY

```
      1  0          RUN NAME       FINAL REGRESSION
      2  0          FILE HANDLE FINALDAT/NAME='BASDATFF DATA A'
      3  0          DATA LIST FILE=FINALDAT FREE/
      4  0
      5  0                              YEAR,STATE,PERSINC,POP,MILPAY,CIVPAY,
      6  0                             PROCCON,RDCON,SERVCON,CONSCON,MFGEMP,    FHEH,FWEL,
      7  0                             STHEH,STWEL,PERINCTX,CORINCTX,MANWAGE,
      8  0                             MANINC, CORPPINC,  LNDAREA,RETIREE,TOTEMP,WREMP,
      9  0                             SEREMP,POPLAG,TOTEMPLG,WREMPLG,SEREMPLG,MFGEMPLG,
     10  0                            YR76 TO YR84,SC1 TO SC47
     11  0          VAR LABELS        PERSINC 'PERSONAL INCOME'
     12  0                            MILPAY 'MILITARY PAYROLL'
     13  0                            CIVPAY 'CIVILIAN PAYROLL'
     14  0                            PROCCON 'PROCURMENT CONTRACTS'
     15  0                            RDCON 'R&D CONTRACTS'
     16  0                            SERVCON 'SERVICE CONTRACTS'
     17  0                            CONSCON 'CONSTRUCTION CONTRACTS'
     18  0                            STHEH 'STATE SPENDING (HIGH. EDUCAT. HEALTH)'
     19  0                            STWEL 'STATE SPENDING WELFARE'
     20  0                            PERINCTX 'PERSONAL INCOME TAX'
     21  0                            CORINCTX 'CORPORATE INCOME TAX'
     22  0                            MANWAGE 'AVERAGE MANUFACT. WAGE'
     23  0                            POP  'POPULATION'
     24  0                            TOTEMP 'TOTAL NON-AG EMPLOYMENT'
     25  0                            WREMP 'WHOLESALE-RETAIL TRADE EMP.'
     26  0                            SEREMP 'SERVICE EMPLOYMENT'
     27  0                            MFGEMP  'MANUFACTURING EMPLOYMENT'
     28  0                            FHEH 'FEDERAL SPENDING (HIGH. EDUCAT. HEALTH)'
     29  0                            FWEL 'FEDERAL WELFARE SPENDING'
     30  0                            RETIREE '% POP. OVER 65 YEARS'
     31  0                            POPLAG 'POPULATION LAGGED 1 YR.'
114 DEC 87    FINAL REGRESSION
2
  20:46:07    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
     32  0          COMPUTE           PROCCONS = LAG(PROCCON,1)
     33  0          COMPUTE           EXPROCON = RDCON + SERVCON + CONSCON
     34  0          COMPUTE           CORPINC = CORPPINC*1000
     35  0
     36  0          COMPUTE           DODTOTAL = MILPAY + CIVPAY + PROCCON + RDCON + SERVCON +
     37  0                                CONSCON
     38  0          COMPUTE           CORTXPY = CORINCTX/CORPINC
     39  0          COMPUTE           INCTXPY = PERINCTX/PERSINC
     40  0          COMPUTE           POPDEN = POP/LNDAREA
     41  0          COMPUTE           PCSTHEH = STHEH/POP
     42  0          COMPUTE           PCSTWEL = STWEL/POP
     43  0          COMPUTE           AJSTHEH = STHEH-FHEH
     44  0          COMPUTE           AJSTWEL = STWEL-FWEL
     45  0          COMPUTE           DELTEMP =(TOTEMP-TOTEMPLG)/TOTEMPLG
     46  0          COMPUTE           PCPERINC = PERSINC/POP
     47  0          COMPUTE           PERSPAY = MILPAY + CIVPAY
     48  0          COMPUTE           DODCONS = CONSCON + PROCCON + SERVCON + RDCON
     49  0          VAR LABELS        DODTOTAL 'TOTAL DOD EXPENDITURES'
     50  0                            DODCONS 'TOTAL DOD CONTRACTS'
     51  0                            PERSPAY 'DOD MILITARY AND CIVILIAN PAYROLL'
     52  0                            INCTXPY 'PERSONAL INCOME TAX PROXY'
     53  0                            CORPINC 'CORPORATE INCOME'
     54  0                            CORTXPY 'CORPORATE INCOME TAX PROXY'
     55  0                            POPDEN 'POPULATION DENSITY'
     57  0                            PCPERINC 'PERCAPITA PERSONAL INCOME'
```

```
    58  0                          PCSTHEH 'PERCAPITA STATE SPENDING HEALTH,HIWAY,EDUC.'
    59  0                          PCSTWEL 'PERCAPITA STATE SPENDING WELFARE'
    60  0          REGRESSION VARIABLES=(COLLECT)/
    61  0                     CRITERIA=TOL(.0001)/
    62  0                     DEPENDENT=POP/ENTER POPLAG MANWAGE
    63  0                     INCTXPY POPDEN DELTEMP PCSTWEL PCSTHEH PCPERINC/
    64  0                     SAVE PRED(POPHAT)
0THERE ARE    91856 BYTES OF MEMORY AVAILABLE.
 THE LARGEST CONTIGUOUS AREA HAS    90336 BYTES.
114 DEC 87   FINAL REGRESSION
3
 20:46:08    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

0     3724 BYTES OF MEMORY REQUIRED FOR REGRESSION PROCEDURE.
           0 MORE BYTES MAY BE NEEDED FOR RESIDUALS PLOTS.

114 DEC 87   FINAL REGRESSION
4
 20:46:13    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
-LISTWISE DELETION OF MISSING DATA
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP   POPULATION

 VARIABLE(S) ENTERED ON STEP NUMBER  1..    PCPERINC  PERCAPITA PERSONAL INCOME
                                            2..    DELTEMP
                                            3..    PCSTHEH   PERCAPITA STATE SPENDING HEALTH,HIWAY,EC
                                            4..    INCTXPY   PERSONAL INCOME TAX PROXY
                                            5..    POPLAG    POPULATION LAGGED 1 YR.
                                            6..    MANWAGE   AVERAGE MANUFACT. WAGE
                                            7..    POPDEN    POPULATION DENSITY
                                            8..    PCSTWEL   PERCAPITA STATE SPENDING WELFARE
0
 MULTIPLE R           .99988          ANALYSIS OF VARIANCE
 R SQUARE             .99976                        DF      SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .99975          REGRESSION     8          10899.52028       1362.44004
 STANDARD ERROR       .07474          RESIDUAL     471              2.63080          .00559

                                                  F =  243921.49422       SIGNIF F =  .0000
------------------ VARIABLES IN THE EQUATION ------------------
0VARIABLE              B         SE B       BETA          T  SIG T

 PCPERINC         .013504      .006449    .002048      2.094  .0368
 DELTEMP          .529516      .106543    .003695      4.970  .0000
 PCSTHEH          .206886      .063041    .002680      3.282  .0011
 INCTXPY        -1.174916      .372290   -.002612     -3.156  .0017
 POPLAG          1.016839  8.8786E-04   1.003906   1145.274  .0000
 MANWAGE         -.033113      .007356   -.003947     -4.502  .0000
 POPDEN          -.066552      .021037   -.003128     -3.164  .0017
 PCSTWEL         -.591638      .140352   -.004432     -4.215  .0000
 (CONSTANT)       .039910      .033944                1.176  .2403
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
5
 20:46:15    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP   POPULATION

0RESIDUALS STATISTICS:

                              MIN          MAX      MEAN  STD DEV    N

 *PRED              .4569     26.1734    4.7106    4.7702  480
 *RESID           -.3753       .4667     .0000     .0741  480
 *ZPRED           -.8917      4.4994     .0000    1.0000  480
 *ZRESID         -5.0223      6.2444     .0000     .9916  480
0TOTAL CASES =       480
-
                                                * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
-
 FROM EQUATION   1:   1 NEW VARIABLES HAVE BEEN CREATED.
0 NAME       CONTENTS
    ----       --------
```

```
    POPHAT      PREDICTED VALUE
114 DEC 87   FINAL REGRESSION
6
  20:46:16    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

OPRECEDING TASK REQUIRED       1.93 SECONDS CPU TIME;       8.51 SECONDS ELAPSED.

     65  0          REGRESSION VARIABLES=(COLLECT)/
     66  0                     CRITERIA=TOL(.0001)/

     67  0                     DEPENDENT= TOTEMP MFGEMP WREMP SEREMP/ENTER
     68  0                     POPHAT PERSPAY DODCONS
     69  0                     STHEH STWEL  MANWAGE CORTXPY     YR76 TO YR84
     70  0                     SC1 TO SC47/
0                                  * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
OEQUATION NUMBER 1    DEPENDENT VARIABLE..   TOTEMP   TOTAL NON-AG EMPLOYMENT
0
  MULTIPLE R           .99917          ANALYSIS OF VARIANCE
  R SQUARE             .99835                              DF      SUM OF SQUARES      MEAN SQUARE
  ADJUSTED R SQUARE    .99810          REGRESSION          63          1776.15710        28.19297
  STANDARD ERROR       .08399          RESIDUAL           416             2.93463          .00705

                                                          F =    3996.50841       SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
10
  20:46:21    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

0                                  * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
OEQUATION NUMBER 1    DEPENDENT VARIABLE..   TOTEMP   TOTAL NON-AG EMPLOYMENT
------------------- VARIABLES IN THE EQUATION ------------------
OVARIABLE                B         SE B        BETA         T  SIG T

  SC47           -.127057      .091710    -.009426    -1.385  .1667
  YR84           -.024521      .018895    -.003821    -1.298  .1951
  STHEH           .124887      .035656     .090167     3.503  .0005
  SC19            .043644      .108420     .003238      .403  .6875
  SC18           -.096512      .083933    -.007160    -1.150  .2509
  SC16           -.277852      .077903    -.020613    -3.567  .0004
  SC1            -.253291      .081336    -.018791    -3.114  .0020
  SC12           -.197840      .094365    -.014677    -2.097  .0366
  SC21           -.073569      .077738    -.005458     -.946  .3445
  SC15           -.285359      .076692    -.021170    -3.721  .0002
  SC9            -.040926      .116951    -.003036     -.350  .7266
  SC23           -.198946      .079127    -.014759    -2.514  .0123
  SC40           -.143964      .091519    -.010680    -1.573  .1165
  SC45           -.257994      .081699    -.019140    -3.158  .0017
  SC44            .044948      .159624     .003335      .282  .7784
  SC13           -.173676      .064403    -.012885    -2.697  .0073
  SC28           -.041984      .134831    -.003115     -.311  .7557
  SC34           -.112030      .067575    -.008311    -1.658  .0981
  YR79            .007286      .018170     .001135      .401  .6886
  SC38           -.018028      .088565    -.001337     -.204  .8388
  SC5             .044872      .062280     .003329      .720  .4716
  SC31           -.018684      .129802    -.001386     -.144  .8856
  SC2            -.115809      .057646    -.008592    -2.009  .0452
  SC35           -.060140      .064426    -.004462     -.933  .3511
  SC22           -.226093      .072692    -.016773    -3.110  .0020
  SC6             .001847      .065947  1.370E-04      .028  .9777
  SC14           -.048035      .058065    -.003564     -.827  .4086
  YR82           -.069323      .017457    -.010802    -3.971  .0001
  SC46           -.188361      .048225    -.013974    -3.906  .0001
  SC8            -.420046      .181175    -.031162    -2.318  .0209
  SC3            -.159860      .069127    -.011860    -2.313  .0212
  SC29           -.059775      .058203    -.004435    -1.027  .3050
  SC42           -.014323      .046359    -.001063     -.309  .7575
  SC20           -.669915      .176557    -.049699    -3.794  .0002
  YR76           -.140541      .019358    -.021900    -7.260  .0000
  SC25            .007407      .047090  5.495E-04      .157  .8751
  SC33           -.321853      .189491    -.023877    -1.699  .0902
  SC17           -.007001      .054226 -5.194E-04     -.129  .8973
  SC11           -.194937      .212294    -.014462     -.918  .3590
  YR83           -.088509      .018863    -.013792    -4.692  .0000
  SC10           -.016595      .046708    -.001231     -.355  .7226
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 SC36          -.458415     .218953   -.034009    -2.094  .0369
 SC32           .009972     .054225  7.398E-04      .184  .8542
 SC37           .084504     .061611    .006269     1.372  .1709
 YR81          -.013335     .017581   -.002078     -.758  .4486
 SC24          -.010953     .060173 -8.126E-04     -.182  .8557
 SC26           .073463     .038633    .005450     1.902  .0579
 SC41          -.248086     .249352   -.018405     -.995  .3204
 YR80          -.006044     .018107 -9.418E-04     -.334  .7387
 SC7            .054968     .047650    .004078     1.154  .2493
 SC39          -.009158     .047606 -6.794E-04     -.192  .8475
 YR78          -.036876     .018646   -.005746    -1.978  .0486
 SC27           .071946     .059819    .005337     1.203  .2298
 SC30          -.853748     .317233   -.063337    -2.691  .0074
 YR77          -.101830     .019534   -.015868    -5.213  .0000
 SC43           .039679     .052118    .002944      .761  .4469
 CORTXPY      -1.739927    2.894886   -.003583     -.601  .5481
 DODCONS        .077337     .017785    .057733     4.348  .0000
 MANWAGE        .019782     .044236    .005837      .447  .6550
 SC4          -1.077247     .428780   -.079918    -2.512  .0124
 PERSPAY        -.149777    .063442   -.044973    -2.361  .0187
 STHEL           .168447    .059437    .065397     2.834  .0048
 POPHAT          .376502    .021746    .931905    17.314  .0000
 (CONSTANT)     -.067948    .183974               -.369  .7121
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
12

0                                  * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
0EQUATION NUMBER 2    DEPENDENT VARIABLE..   MFGEMP   MANUFACTURING EMPLOYMENT
0
 MULTIPLE R           .99670          ANALYSIS OF VARIANCE
 R SQUARE             .99342                          DF      SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .99242          REGRESSION      63            85.94276          1.36417
 STANDARD ERROR       .03700          RESIDUAL       416              .56951           .00137

                                                      F =     996.46915       SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
15
 20:46:23    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

0                                  * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
0EQUATION NUMBER 2    DEPENDENT VARIABLE..   MFGEMP   MANUFACTURING EMPLOYMENT
------------------- VARIABLES IN THE EQUATION -----------------
0VARIABLE              B        SE B       BETA         T  SIG T

 SC47           .297194     .040401    .099984     7.356  .0000
 YR84           .017580     .008324    .012423     2.112  .0353
 STHEH          .111521     .015708    .365129     7.100  .0000
 SC19           .462997     .047762    .155764     9.694  .0000
 SC18          -.007747     .036975   -.002606     -.210  .8341
 SC16          -.059180     .034318   -.019910    -1.724  .0854
 SC1            .119975     .035831    .040363     3.348  .0009
 SC12           .337724     .041570    .113619     8.124  .0000
 SC21           .122499     .034246    .041212     3.577  .0004
 SC15           .048881     .033785    .016445     1.447  .1487
 SC9            .208364     .051520    .070099     4.044  .0001
 SC23           .216255     .034858    .072754     6.204  .0000
 SC40           .269028     .040317    .090508     6.673  .0000
 SC45           .005768     .035990    .001941      .160  .8727
 SC44           .063053     .070319    .021213      .897  .3704
 SC13           .051597     .028371    .017358     1.819  .0697
 SC28           .392102     .059397    .131913     6.601  .0000
 SC34          -.002002     .029768 -6.735E-04     -.067  .9464
 YR79           .061927     .008004    .043761     7.737  .0000
 SC38           .204710     .039015    .068870     5.247  .0000
 SC5            .006618     .027436    .002226      .241  .8095
 SC31           .426811     .057181    .143590     7.464  .0000
 SC2           -.012256     .025394   -.004123     -.483  .6296
 SC35           .062720     .028382    .021101     2.210  .0277
 SC22           .114390     .032023    .038484     3.572  .0004
 SC6            .337099     .029051    .113409    11.604  .0000
 SC14           .068148     .025579    .022927     2.664  .0080
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 YR82            .018521     .007690    .013088     2.408  .0165
 SC46           -.003426     .021244   -.001153     -.161  .8719
 SC8            -.130424     .079812   -.043878    -1.634  .1030
 SC3             .117133     .030452    .039406     3.846  .0001
 SC29           -.029531     .025640   -.009935    -1.152  .2501
 SC42            .012550     .020422    .004222      .615  .5392
 SC20            .534438     .077778    .179799     6.871  .0000
 YR76            .021683     .008528    .015322     2.543  .0114
 SC25            .028086     .020745    .009449     1.354  .1765
 SC33            .615108     .083476    .206938     7.369  .0000
 SC17            .102578     .023888    .034510     4.294  .0000
 SC11            .502285     .093521    .168982     5.371  .0000
 YR83            .011116     .008310    .007855     1.338  .1817
 SC10            .024341     .020576    .008189     1.183  .2375
 SC36            .646215     .096455    .217403     6.700  .0000
 SC32            .008504     .023887    .002861      .356  .7220
 SC37            .133553     .027141    .044931     4.921  .0000
 YR81            .045303     .007745    .032013     5.849  .0000
 SC24           -.008129     .026508   -.002735     -.307  .7593
 SC26           -.008852     .017019   -.002978     -.520  .6033
 SC41            .079901     .109846    .026881      .727  .4674
 YR80            .040128     .007976    .028357     5.031  .0000
 SC7             .058959     .020991    .019835     2.809  .0052
 SC39            .028692     .020972    .009653     1.368  .1720
 YR78            .062026     .008214    .043831     7.551  .0000
 SC27            .113672     .026352    .038242     4.314  .0000
 SC30            .543004     .139750    .182681     3.886  .0001
 YR77            .045789     .008605    .032356     5.321  .0000
 SC43            .068768     .022959    .023135     2.995  .0029
 CORTXPY        -.268847    1.275275   -.002511     -.211  .8331
 DODCONS        -.025097     .007835   -.084961    -3.203  .0015
 MANWAGE         .020713     .019487    .027715     1.063  .2884
 SC4             .736044     .188889    .247624     3.897  .0001
 PERSPAY         .031572     .027948    .042991     1.130  .2593
 STWEL          -.121662     .026184   -.214197    -4.646  .0000
 POPHAT          .041350     .009580    .464133     4.317  .0000
 (CONSTANT)     -.153163     .081046               -1.890  .0595
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
17
  20:46:23    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 3    DEPENDENT VARIABLE..   WREMP   WHOLESALE-RETAIL TRADE EMP.
0
  MULTIPLE R           .99904          ANALYSIS OF VARIANCE
  R SQUARE             .99808                          DF      SUM OF SQUARES      MEAN SQUARE
  ADJUSTED R SQUARE    .99779          REGRESSION      63           92.87984          1.47428
  STANDARD ERROR       .02071          RESIDUAL       416             .17843           .00043

                                                      F =    3437.14350       SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
20
  20:46:24    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 3    DEPENDENT VARIABLE..   WREMP   WHOLESALE-RETAIL TRADE EMP.
------------------- VARIABLES IN THE EQUATION ------------------
0VARIABLE              B         SE B       BETA         T  SIG T

  SC47           -.104977     .022614   -.034052    -4.642  .0000
  YR84           -.010830     .004659   -.007379    -2.324  .0206
  STHEH           .007092     .008792    .022387      .807  .4204
  SC19           -.115465     .026734   -.037454    -4.319  .0000
  SC18           -.069169     .020696   -.022437    -3.342  .0009
  SC16           -.118292     .019209   -.038371    -6.158  .0000
  SC1            -.144801     .020056   -.046970    -7.220  .0000
  SC12           -.145570     .023269   -.047220    -6.256  .0000
  SC21           -.037730     .019169   -.012239    -1.968  .0497
  SC15           -.127047     .018911   -.041211    -6.718  .0000
  SC9            -.079460     .028838   -.025775    -2.755  .0061
  SC23           -.117641     .019511   -.038160    -6.029  .0000
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SC40            -.118515      .022567    -.038444     -5.252   .0000
SC45            -.097122      .020145    -.031504     -4.821   .0000
SC44            -.113427      .039360    -.036793     -2.882   .0042
SC13            -.052611      .015881    -.017066     -3.313   .0010
SC28            -.144187      .033247    -.046771     -4.337   .0000
SC34            -.058034      .016663    -.018825     -3.483   .0005
YR79            -.013451      .004480    -.009165     -3.002   .0028
SC38            -.087407      .021839    -.028353     -4.002   .0001
SC5             -.011534      .015357    -.003741      -.751   .4530
SC31            -.150282      .032007    -.048748     -4.695   .0000
SC2             -.050148      .014214    -.016267     -3.528   .0005
SC35            -.033339      .015886    -.010814     -2.099   .0365
SC22            -.108153      .017924    -.035082     -6.034   .0000
SC6             -.082568      .016261    -.026783     -5.078   .0000
SC14            -.034039      .014318    -.011042     -2.377   .0179
YR82            -.030397      .004305    -.020710     -7.062   .0000
SC46            -.076871      .011891    -.024935     -6.464   .0000
SC8             -.133734      .044674    -.043380     -2.994   .0029
SC3             -.073840      .017045    -.023952     -4.332   .0000
SC29            -.023568      .014352    -.007645     -1.642   .1013
SC42            -.013485      .011431    -.004374     -1.180   .2388
SC20            -.370337      .043536    -.120129     -8.506   .0000
YR76            -.043903      .004773    -.029913     -9.198   .0000
SC25             .002171      .011612   7.041E-04       .187   .8518
SC33            -.286062      .046725    -.092792     -6.122   .0000
SC17            -.017374      .013371    -.005636     -1.299   .1945
SC11            -.211458      .052348    -.068592     -4.039   .0001
YR83            -.029869      .004651    -.020351     -6.422   .0000
SC10            -.006535      .011517    -.002120      -.567   .5708
SC36            -.398584      .053990    -.129292     -7.383   .0000
SC32             .009016      .013371     .002924       .674   .5005
SC37             .003394      .015192     .001101       .223   .8234
YR81            -.021136      .004335    -.014401     -4.875   .0000
SC24            -.002569      .014838 -8.334E-04      -.173   .8626
SC26        7.33813E-04       .009526  2.380E-04       .077   .9386
SC41            -.188591      .061486    -.061175     -3.067   .0023
YR80            -.017446      .004465    -.011887     -3.908   .0001
SC7              .007108      .011750     .002306       .605   .5456
SC39             .005329      .011739     .001728       .454   .6501
YR78            -.025013      .004598    -.017043     -5.440   .0000
SC27             .004787      .014750     .001553       .325   .7457
SC30            -.684190      .078224    -.221936     -8.747   .0000
YR77            -.037613      .004817    -.025627     -7.809   .0000
SC43             .005256      .012851     .001705       .409   .6828
CORTXPY         -.083332      .713827 -7.503E-04      -.117   .9071
DODCONS          .022762      .004385     .074295     5.190   .0000
MANWAGE          .007924      .010908     .010223       .726   .4680
SC4             -.661681      .105730    -.214635     -6.258   .0000
PERSPAY         -.030792      .015644    -.040427     -1.968   .0497
STWEL            .051638      .014656     .087657     3.523   .0005
POPHAT           .107510      .005362    1.163526    20.050   .0000
(CONSTANT)      -.025569      .045365                 -.564   .5733
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
22
 20:46:24    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP      VM/SP CMS
0                                * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 4    DEPENDENT VARIABLE..   SEREMP   SERVICE EMPLOYMENT
0
 MULTIPLE R           .93673          ANALYSIS OF VARIANCE
 R SQUARE             .87747                              DF      SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .85891          REGRESSION          63           91.41371           1.45101
 STANDARD ERROR       .17517          RESIDUAL           416           12.76522            .03069

                                                          F =      47.28637      SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
25
 20:46:26    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP      VM/SP CMS
0                                * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 4    DEPENDENT VARIABLE..   SEREMP   SERVICE EMPLOYMENT
```

---------- VARIABLES IN THE EQUATION ----------

OVARIABLE	B	SE B	BETA	T	SIG T
SC47	-.239073	.191273	-.073294	-1.250	.2120
YR84	-.037561	.039408	-.024187	-.953	.3411
STHEH	-.135969	.074366	-.405675	-1.828	.0682
SC19	-.369760	.226124	-.113360	-1.635	.1028
SC18	-.631539	.175052	-.193615	-3.608	.0003
SC16	-.338499	.162477	-.103776	-2.083	.0378
SC1	-.564054	.169636	-.172925	-3.325	.0010
SC12	-.408670	.196810	-.125289	-2.076	.0385
SC21	-.085705	.162133	-.026275	-.529	.5974
SC15	-.464221	.159951	-.142319	-2.902	.0039
SC9	-.919410	.243916	-.281869	-3.769	.0002
SC23	-.466022	.165030	-.142871	-2.824	.0050
SC40	-.412673	.190876	-.126516	-2.162	.0312
SC45	-.497025	.170393	-.152376	-2.917	.0037
SC44	-1.309389	.332917	-.401427	-3.933	.0001
SC13	-.042576	.134320	-.013053	-.317	.7514
SC28	-.701704	.281207	-.215126	-2.495	.0130
SC34	-.470345	.140936	-.144196	-3.337	.0009
YR79	-.020103	.037896	-.012945	-.530	.5961
SC38	-.631188	.184714	-.193507	-3.417	.0007
SC5	-.341158	.129894	-.104591	-2.626	.0089
SC31	-.955668	.270719	-.292985	-3.530	.0005
SC2	-.221594	.120227	-.067935	-1.843	.0660
SC35	-.036764	.134370	-.011271	-.274	.7845
SC22	-.390960	.151608	-.119859	-2.579	.0103
SC6	-.138084	.137540	-.042333	-1.004	.3160
SC14	-.214787	.121102	-.065849	-1.774	.0769
YR82	.047299	.036409	.030458	1.299	.1946
SC46	-.047753	.100579	-.014640	-.475	.6352
SC8	-1.102368	.377864	-.337960	-2.917	.0037
SC3	-.256229	.144173	-.078554	-1.777	.0763
SC29	-.180016	.121390	-.055189	-1.483	.1388
SC42	-.184277	.096687	-.056495	-1.906	.0573
SC20	-.739275	.368233	-.226644	-2.008	.0453
YR76	-.082509	.040374	-.053132	-2.044	.0416
SC25	-.123607	.098213	-.037895	-1.259	.2089
SC33	-.942731	.395208	-.289019	-2.385	.0175
SC17	-.098779	.113095	-.030283	-.873	.3829
SC11	-1.069392	.442767	-.327850	-2.415	.0162
YR83	-.049432	.039342	-.031832	-1.256	.2096
SC10	.017280	.097416	.005298	.177	.8593
SC36	-1.205698	.456656	-.369638	-2.640	.0086
SC32	-.020571	.113093	-.006307	-.182	.8558
SC37	-.088274	.128499	-.027063	-.687	.4925
YR81	-.033418	.036668	-.021519	-.911	.3626
SC24	.105276	.125500	.032275	.839	.4020
SC26	.056441	.080575	.017304	.700	.4840
SC41	-1.928720	.520057	-.591299	-3.709	.0002
YR80	-.018306	.037764	-.011788	-.485	.6281
SC7	.066967	.099379	.020531	.674	.5008
SC39	-.076917	.099290	-.023581	-.775	.4390
YR78	-.076835	.038888	-.049478	-1.976	.0488
SC27	-.090209	.124761	-.027656	-.723	.4700
SC30	-1.353221	.661632	-.414865	-2.045	.0415
YR77	-.093707	.040740	-.060342	-2.300	.0219
SC43	.027544	.108698	.008444	.253	.8001
CORTXPY	-5.847305	6.037663	-.049759	-.968	.3334
DODCONS	-.012004	.037093	-.037033	-.324	.7464
MANHAGE	-.084598	.092261	-.103153	-.917	.3597
SC4	-3.723744	.894278	-1.141611	-4.164	.0000
PERSPAY	.680427	.132317	.844310	5.142	.0000
STHEL	.290074	.123965	.465389	2.340	.0198
POPHAT	.158597	.045353	1.622217	3.497	.0005
/(CONSTANT)	.323076	.383702		.842	.4003

APPENDIX G

REGRESSION EQUATION AND RESULTS USING ALL DEFENSE VARIABLES

```
     1  0          RUN NAME       FINAL REGRESSION
     2  0          FILE HANDLE FINALDAT/NAME='BASDATFF DATA A'
     3  0          DATA LIST FILE=FINALDAT FREE/
     4  0
     5  0                              YEAR,STATE,PERSINC,POP,MILPAY,CIVPAY,
     6  0                             PROCCON,RDCON,SERVCON,CONSCON,MFGEMP,   FHEH,FWEL,
     7  0                             STHEH,STWEL,PERINCTX,CORINCTX,MANWAGE,
     8  0                             MANINC, CORPPINC,  LNDAREA,RETIREE,TOTEMP,WREMP,
     9  0                             SEREMP,POPLAG,TOTEMPLG,WREMPLG,SEREMPLG,MFGEMPLG,
    10  0                             YR76 TO YR84,SC1 TO SC47
    11  0          VAR LABELS         PERSINC 'PERSONAL INCOME'
    12  0                             MILPAY 'MILITARY PAYROLL'
    13  0                             CIVPAY 'CIVILIAN PAYROLL'
    14  0                             PROCCON 'PROCURMENT CONTRACTS'
    15  0                             RDCON 'R&D CONTRACTS'
    16  0                             SERVCON 'SERVICE CONTRACTS'
    17  0                             CONSCON 'CONSTRUCTION CONTRACTS'
    18  0                             STHEH 'STATE SPENDING (HIGH. EDUCAT. HEALTH)'
    19  0                             STWEL 'STATE SPENDING WELFARE'
    20  0                             PERINCTX 'PERSONAL INCOME TAX'
    21  0                             CORINCTX 'CORPORATE INCOME TAX'
    22  0                             MANWAGE 'AVERAGE MANUFACT. WAGE'
    23  0                             POP   'POPULATION'
    24  0                             TOTEMP 'TOTAL NON-AG EMPLOYMENT'
    25  0                             WREMP 'WHOLESALE-RETAIL TRADE EMP.'
    26  0                             SEREMP 'SERVICE EMPLOYMENT'
    27  0                             MFGEMP  'MANUFACTURING EMPLOYMENT'
    28  0                             FHEH 'FEDERAL SPENDING (HIGH. EDUCAT. HEALTH)'
    29  0                             FWEL 'FEDERAL WELFARE SPENDING'
    30  0                             RETIREE '% POP. OVER 65 YEARS'
    31  0                             POPLAG 'POPULATION LAGGED 1 YR.'
114 DEC 87    FINAL REGRESSION
2
 20:25:22     NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
    32  0          COMPUTE            PROCCONS = LAG(PROCCON,1)
    33  0          COMPUTE            EXPROCON = RDCON + SERVCON + CONSCON
    34  0          COMPUTE            CORPINC = CORPPINC*1000
    35  0
    36  0          COMPUTE            DODTOTAL = MILPAY + CIVPAY + PROCCON + RDCON + SERVCON +
    37  0                                CONSCON
    38  0          COMPUTE            CORTXPY = CORINCTX/CORPINC
    39  0          COMPUTE            INCTXPY = PERINCTX/PERSINC
    40  0          COMPUTE            POPDEN = POP/LNDAREA
    41  0          COMPUTE            PCSTHEH = STHEH/POP
    42  0          COMPUTE            PCSTWEL = STWEL/POP
    43  0          COMPUTE            AJSTHEH = STHEH-FHEH
    44  0          COMPUTE            AJSTWEL = STWEL-FWEL
    45  0          COMPUTE            DELTEMP =(TOTEMP-TOTEMPLG)/TOTEMPLG
    46  0          COMPUTE            PCPERINC = PERSINC/POP
    47  0          COMPUTE            PERSPAY = MILPAY + CIVPAY
    48  0          COMPUTE            DODCONS = CONSCON + PROCCON + SERVCON + RDCON
    49  0          VAR LABELS         DODTOTAL 'TOTAL DOD EXPENDITURES'
    50  0                             DODCONS 'TOTAL DOD CONTRACTS'
    51  0                             PERSPAY 'DOD MILITARY AND CIVILIAN PAYROLL'
    52  0                             INCTXPY 'PERSONAL INCOME TAX PROXY'
    53  0                             CORPINC 'CORPORATE INCOME'
    54  0                             CORTXPY 'CORPORATE INCOME TAX PROXY'
    55  0                             POPDEN 'POPULATION DENSITY'
    57  0                             PCPERINC 'PERCAPITA PERSONAL INCOME'
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    58  0                          PCSTHEH 'PERCAPITA STATE SPENDING HEALTH,HIWAY,EDUC.'
    59  0                          PCSTWEL 'PERCAPITA STATE SPENDING WELFARE'
    60  0          CONDESCRIPTIVE  MILPAY CIVPAY TOTEMP MFGEMP WREMP SEREMP
    61  0                          POP DODTOTAL PERSPAY DODCONS PROCCON SERVCON RDCON
    62  0                          CONSCON STHEH STWEL CORTXPY MANWAGE INCTXPY DELTEMP
    63  0                          PCPERINC PCSTHEH PCSTWEL POPDEN/
    67  0          REGRESSION VARIABLES=(COLLECT)/
    68  0                     CRITERIA=TOL(.0001)/
    69  0                     DEPENDENT=POP/ENTER POPLAG MANWAGE
    70  0                     INCTXPY POPDEN DELTEMP PCSTWEL PCSTHEH PCPERINC/
    71  0                     SAVE PRED(POPHAT)
OTHERE ARE   183832 BYTES OF MEMORY AVAILABLE.
 THE LARGEST CONTIGUOUS AREA HAS   182312 BYTES.
0     3724 BYTES OF MEMORY REQUIRED FOR REGRESSION PROCEDURE.
           0 MORE BYTES MAY BE NEEDED FOR RESIDUALS PLOTS.

114 DEC 87   FINAL REGRESSION
10
 20:25:31    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

0                                   * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
-LISTWISE DELETION OF MISSING DATA
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP   POPULATION

 VARIABLE(S) ENTERED ON STEP NUMBER  1..    PCPERINC  PERCAPITA PERSONAL INCOME
                                            2..    DELTEMP
                                            3..    PCSTHEH   PERCAPITA STATE SPENDING HEALTH,HIWAY,EI
                                            4..    INCTXPY   PERSONAL INCOME TAX PROXY
                                            5..    POPLAG    POPULATION LAGGED 1 YR.
                                            6..    MANWAGE   AVERAGE MANUFACT. WAGE
                                            7..    POPDEN    POPULATION DENSITY
                                            8..    PCSTWEL   PERCAPITA STATE SPENDING WELFARE
0
 MULTIPLE R           .99988          ANALYSIS OF VARIANCE
 R SQUARE             .99976                          DF       SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .99975          REGRESSION       8          10899.52028       1362.44004
 STANDARD ERROR       .07474          RESIDUAL       471              2.63080          .00559

                                                  F =  243921.49422       SIGNIF F =  .0000
------------------ VARIABLES IN THE EQUATION ------------------
0VARIABLE              B         SE B        BETA         T  SIG T

 PCPERINC         .013504     .006449     .002048     2.094  .0368
 DELTEMP          .529516     .106543     .003695     4.970  .0000
 PCSTHEH          .206886     .063041     .002680     3.282  .0011
 INCTXPY        -1.174916     .372290    -.002612    -3.156  .0017
 POPLAG          1.016839  8.8786E-04    1.003906  1145.274  .0000
 MANWAGE         -.033113     .007356    -.003947    -4.502  .0000
 POPDEN          -.066552     .021037    -.003128    -3.164  .0017
 PCSTWEL         -.591638     .140352    -.004432    -4.215  .0000
 (CONSTANT)       .039910     .033944                 1.176  .2403
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
11
 20:25:33    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS

0                                   * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP   POPULATION

0RESIDUALS STATISTICS:

                              MIN          MAX      MEAN  STD DEV    N

 *PRED              .4569     26.1734   4.7106   4.7702  480
 *RESID           -.3753       .4667     .0000    .0741  480
 *ZPRED           -.8917      4.4994     .0000   1.0000  480
 *ZRESID         -5.0223      6.2444     .0000    .9916  480
0TOTAL CASES =      480
-
                                                * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
-

0NUMBER OF VALID OBSERVATIONS (LISTWISE) =       480.00
0VARIABLE       MEAN     STD DEV    MINIMUM    MAXIMUM VALID N   LABEL
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 POPHAT        4.711       4.770      .45695   26.17344      480   PREDICTED VALUE
114 DEC 87   FINAL REGRESSION
14
 20:25:35    NAVAL POSTGRADUATE SCHOOL       IBM 3033AP        VM/SP CMS

OPRECEDING TASK REQUIRED        0.16 SECONDS CPU TIME;        1.08 SECONDS ELAPSED.

    73  0          REGRESSION VARIABLES=(COLLECT)/
    74  0                     CRITERIA=TOL(.0001)/
    75  0                     DEPENDENT= TOTEMP MFGEMP WREMP SEREMP/ENTER
    76  0                     POPHAT MILPAY CIVPAY    CONSCON SERVCON RDCON
    77  0                     STHEH STWEL  PROCCON MANWAGE CORTXPY     YR76 TO YR84
    78  0                     SC1 TO SC47/
OTHERE ARE   182200 BYTES OF MEMORY AVAILABLE.
 THE LARGEST CONTIGUOUS AREA HAS   180888 BYTES.
0    85780 BYTES OF MEMORY REQUIRED FOR REGRESSION PROCEDURE.
           0 MORE BYTES MAY BE NEEDED FOR RESIDUALS PLOTS.

114 DEC 87   FINAL REGRESSION
15
 20:25:38    NAVAL POSTGRADUATE SCHOOL       IBM 3033AP        VM/SP CMS

0                                  * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
OEQUATION NUMBER 1    DEPENDENT VARIABLE..   TOTEMP   TOTAL NON-AG EMPLOYMENT
0
 MULTIPLE R            .99924          ANALYSIS OF VARIANCE
 R SQUARE              .99847                              DF       SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE     .99823          REGRESSION          67          1776.37849        26.51311
 STANDARD ERROR        .08115          RESIDUAL           412             2.71324          .00659

                                                          F =    4025.96566       SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
18
 20:25:40    NAVAL POSTGRADUATE SCHOOL       IBM 3033AP        VM/SP CMS

0                                  * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
OEQUATION NUMBER 1    DEPENDENT VARIABLE..   TOTEMP   TOTAL NON-AG EMPLOYMENT
------------------- VARIABLES IN THE EQUATION ------------------
OVARIABLE                B         SE B        BETA         T  SIG T

 SC47            -.115369      .090434    -.008559    -1.276  .2028
 YR84            -.021002      .018432    -.003273    -1.139  .2552
 STHEH            .081455      .035974     .058810     2.264  .0241
 SC19             .176026      .120361     .013059     1.462  .1444
 SC18             .069918      .129551     .005187      .540  .5897
 SC16            -.268605      .077298    -.019927    -3.475  .0006
 SC1             -.157009      .096319    -.011648    -1.630  .1038
 SC12            -.138499      .098922    -.010275    -1.400  .1622
 SC21            -.045728      .077779    -.003392     -.588  .5569
 SC15            -.235495      .076317    -.017471    -3.086  .0022
 SC9              .071530      .131216     .005307      .545  .5860
 SC23            -.093958      .094803    -.006970     -.991  .3222
 SC40            -.116670      .091899    -.008655    -1.270  .2050
 SC45            -.084657      .099189    -.006280     -.853  .3939
 SC44             .302632      .242365     .022451     1.249  .2125
 SC13            -.167344      .062660    -.012415    -2.671  .0079
 SC28             .050204      .149362     .003724      .336  .7369
 SC34            -.031860      .080931    -.002364     -.394  .6940
 YR79             .014141      .017864     .002204      .792  .4290
 SC38             .055529      .089778     .004120      .619  .5366
 SC5              .114929      .063548     .008526     1.809  .0712
 SC31             .051464      .126169     .003818      .408  .6836
 SC2             -.071000      .057679    -.005267    -1.231  .2190
 SC35            -.058622      .062512    -.004349     -.938  .3489
 SC22            -.190000      .074799    -.014096    -2.540  .0114
 SC6             -.011261      .067423 -8.354E-04      -.167  .8674
 SC14            -.045147      .056593    -.003349     -.798  .4255
 YR82            -.065890      .017396    -.010268    -3.788  .0002
 SC46            -.176501      .046821    -.013094    -3.770  .0002
 SC8             -.275404      .184387    -.020431    -1.494  .1360
 SC3             -.136608      .068196    -.010135    -2.003  .0458
 SC29            -.015652      .059540    -.001161     -.263  .7928
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 SC42            .078377     .064862     .005815     1.208  .2276
 SC20           -.604792     .177887    -.044868    -3.400  .0007
 YR76           -.124364     .019415    -.019379    -6.405  .0000
 SC25            .011085     .045545  8.224E-04      .243  .8078
 SC33           -.145671     .206151    -.010807     -.707  .4802
 SC17           -.010561     .053021 -7.835E-04     - 199  .8422
 SC11           -.090226     .214451    -.006694     -.421  .6742
 YR83           -.090058     .018553    -.014033    -4.854  .0000
 SC10           -.023640     .045345    -.001754     -.521  .6024
 SC36           -.220369     .256017    -.016349     -.861  .3899
 SC32            .003937     .052678  2.921E-04      .075  .9405
 SC37            .098113     .061284     .007279     1.601  .1102
 YR81           -.014314     .017473    -.002231     -.819  .4131
 SC24           -.035313     .058835    -.002620     -.600  .5487
 SC26            .069433     .037387     .005151     1.857  .0640
 SC41            .007433     .268601  5.515E-04      .028  .9779
 YR80       1.34969E-05     .018060  2.103E-06      .001  .9994
 SC7             .046409     .046129     .003443     1.006  .3150
 SC39           -.002450     .046264 -1.818E-04     -.053  .9578
 YR78           -.019886     .018355    -.003099    -1.083  .2793
 SC27            .104873     .060565     .007780     1.732  .0841
 SC30           -.880227     .340489    -.065302    -2.585  .0101
 YR77           -.080899     .019394    -.012606    -4.171  .0000
 SC43            .039515     .050672     .002932      .780  .4359
 CONSCON         .407159     .289356     .006126     1.407  .1601
 CORTXPY        -.781645    2.842459    -.001610     -.275  .7835
 RDCON          -.172746     .064758    -.028098    -2.668  .0079
 PROCCON         .073073     .021929     .034727     3.332  .0009
 SERVCON         .408031     .082558     .052931     4.942  .0000
 MANWAGE         .036004     .043671     .010623      .824  .4102
 MILPAY         -.137463     .089719    -.023474    -1.532  .1262
 SC4            -.384349     .539035    -.028514     -.713  .4762
 STWEL           .203449     .059880     .078987     3.398  .0007
 CIVPAY         -.538782     .218740    -.075446    -2.463  .0142
 POPHAT          .377788     .021050     .935090    17.947  .0000
 (CONSTANT)     -.131729     .181052                -.728  .4673
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
20
  20:25:40    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
0                                    * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 2    DEPENDENT VARIABLE..   MFGEMP   MANUFACTURING EMPLOYMENT
0
  MULTIPLE R          .99678          ANALYSIS OF VARIANCE
  R SQUARE            .99357                          DF      SUM OF SQUARES      MEAN SQUARE
  ADJUSTED R SQUARE   .99252          REGRESSION         67          85.95568          1.28292
  STANDARD ERROR      .03676          RESIDUAL          412            .55659           .00135

                                                    F =     949.64473       SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
23
  20:25:42    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
0                                    * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 2    DEPENDENT VARIABLE..   MFGEMP   MANUFACTURING EMPLOYMENT
------------------- VARIABLES IN THE EQUATION ------------------
0VARIABLE              B        SE B       BETA         T  SIG T

 SC47            .319361     .040960     .107441     7.797  .0000
 YR84            .017475     .008348     .012348     2.093  .0369
 STHEH           .102583     .016294     .335867     6.296  .0000
 SC19            .535480     .054514     .180149     9.823  .0000
 SC18            .084641     .058677     .028475     1.442  .1499
 SC16           -.039483     .035010    -.013283    -1.128  .2601
 SC1             .172626     .043625     .058076     3.957  .0001
 SC12            .368112     .044804     .123843     8.216  .0000
 SC21            .147390     .035228     .049586     4.184  .0000
 SC15            .062426     .034566     .021002     1.806  .0716
 SC9             .263121     .059431     .088521     4.427  .0000
 SC23            .261042     .042938     .087821     6.079  .0000
 SC40            .301402     .041623     .101399     7.241  .0000
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 SC45            .053237     .044925     .017910     1.185   .2367
 SC44            .210553     .109773     .070836     1.918   .0558
 SC13            .061475     .028380     .020682     2.166   .0309
 SC28            .469478     .067650     .157944     6.940   .0000
 SC34            .035277     .036655     .011868      .962   .3364
 YR79            .058418     .008091     .041281     7.220   .0000
 SC38            .224254     .040663     .075445     5.515   .0000
 SC5             .023371     .028782     .007863      .812   .4173
 SC31            .433763     .057145     .145929     7.591   .0000
 SC2            -.001929     .026124 -6.490E-04      -.074   .9412
 SC35            .070168     .028313     .023606     2.478   .0136
 SC22            .138490     .033878     .046591     4.088   .0001
 SC6             .350402     .030537     .117884    11.475   .0000
 SC14            .077608     .025632     .026109     3.028   .0026
 YR82            .014302     .007879     .010107     1.815   .0702
 SC46            .001995     .021206  6.711E-04      .094   .9251
 SC8            -.074194     .083513    -.024961     -.888   .3748
 SC3             .133055     .030888     .044763     4.308   .0000
 SC29           -.008495     .026967    -.002858     -.315   .7529
 SC42            .051392     .029377     .017290     1.749   .0810
 SC20            .591172     .080569     .198886     7.337   .0000
 YR76            .016080     .008794     .011363     1.829   .0682
 SC25            .030711     .020628     .010332     1.489   .1373
 SC33            .701235     .093371     .235914     7.510   .0000
 SC17            .112817     .024015     .037954     4.698   .0000
 SC11            .565025     .097130     .190089     5.817   .0000
 YR83            .009612     .008403     .006792     1.144   .2533
 SC10            .022186     .020538     .007464     1.080   .2807
 SC36            .779116     .115956     .262115     6.719   .0000
 SC32            .009804     .023859     .003298      .411   .6814
 SC37            .151425     .027757     .050943     5.455   .0000
 YR81            .040640     .007914     .028718     5.135   .0000
 SC24           -.014991     .026648    -.005043     -.563   .5740
 SC26           -.009241     .016933    -.003109     -.546   .5855
 SC41            .166252     .121655     .055932     1.367   .1725
 YR80            .035079     .008180     .024788     4.289   .0000
 SC7             .057528     .020893     .019354     2.753   .0062
 SC39            .033978     .020954     .011431     1.622   .1057
 YR78            .060706     .008313     .042897     7.302   .0000
 SC27            .131437     .027431     .044219     4.792   .0000
 SC30            .730534     .154215     .245771     4.737   .0000
 YR77            .041981     .008784     .029666     4.779   .0000
 SC43            .073937     .022950     .024874     3.222   .0014
 CONSCON        -.030610     .131056    -.002089     -.234   .8154
 CORTXPY        -.038993    1.287414 -3.641E-04      -.030   .9759
 RDCON          -.058613     .029330    -.043234    -1.998   .0463
 PROCCON        -.016919     .009932    -.036463    -1.703   .0892
 SERVCON        -.105419     .037392    -.062015    -2.819   .0050
 MANWAGE         .030118     .019779     .040299     1.523   .1286
 MILPAY          .110696     .040636     .085723     2.724   .0067
 SC4            1.085813     .244141     .365296     4.447   .0000
 STWEL          -.141959     .027121    -.249931    -5.234   .0000
 CIVPAY         -.108469     .099072    -.068879    -1.095   .2742
 POPHAT          .041122     .009534     .461569     4.313   .0000
 (CONSTANT)     -.186518     .082002               -2.275   .0234
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
25
 20:25:42    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
0                              * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 3    DEPENDENT VARIABLE..   WREMP   WHOLESALE-RETAIL TRADE EMP.
0
 MULTIPLE R           .99910          ANALYSIS OF VARIANCE
 R SQUARE             .99821                          DF       SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .99792          REGRESSION      67            92.89176          1.38644
 STANDARD ERROR       .02010          RESIDUAL       412              .16651           .00040

                                                     F =    3430.56158       SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
28
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20:25:43 NAVAL POSTGRADUATE SCHOOL IBM 3033AP VM/SP CMS

0 **** MULTIPLE REGRESSION ****

OEQUATION NUMBER 3 DEPENDENT VARIABLE.. WREMP WHOLESALE-RETAIL TRADE EMP.

---------- VARIABLES IN THE EQUATION ----------

OVARIABLE	B	SE B	BETA	T	SIG T
SC47	-.104182	.022403	-.033794	-4.650	.0000
YR84	-.009516	.004566	-.006483	-2.084	.0378
STHEH	-.002206	.008912	-.006965	-.248	.8046
SC19	-.090108	.029817	-.029229	-3.022	.0027
SC18	-.053014	.032093	-.017197	-1.652	.0993
SC16	-.119575	.019149	-.038787	-6.244	.0000
SC1	-.133915	.023861	-.043439	-5.612	.0000
SC12	-.140365	.024506	-.045531	-5.728	.0000
SC21	-.033040	.019268	-.010717	-1.715	.0871
SC15	-.119566	.018906	-.038785	-6.324	.0000
SC9	-.068931	.032506	-.022360	-2.121	.0346
SC23	-.105745	.023485	-.034301	-4.503	.0000
SC40	-.115144	.022766	-.037350	-5.058	.0000
SC45	-.069469	.024572	-.022534	-2.827	.0049
SC44	-.098885	.060040	-.032076	-1.647	.1003
SC13	-.051462	.015523	-.016693	-3.315	.0010
SC28	-.136284	.037001	-.044207	-3.683	.0003
SC34	-.050875	.020049	-.016503	-2.538	.0115
YR79	-.011304	.004425	-.007702	-2.554	.0110
SC38	-.076393	.022241	-.024780	-3.435	.0007
SC5	.001049	.015742	3.404E-04	.067	.9469
SC31	-.135248	.031256	-.043872	-4.327	.0000
SC2	-.043036	.014289	-.013960	-3.012	.0028
SC35	-.033745	.015486	-.010946	-2.179	.0299
SC22	-.104850	.018530	-.034011	-5.659	.0000
SC6	-.090314	.016702	-.029296	-5.407	.0000
SC14	-.034308	.014020	-.011129	-2.447	.0148
YR82	-.028805	.004309	-.019626	-6.684	.0000
SC46	-.074517	.011599	-.024172	-6.424	.0000
SC8	-.110526	.045678	-.035852	-2.420	.0160
SC3	-.069363	.016894	-.022500	-4.106	.0000
SC29	-.016543	.014750	-.005366	-1.122	.2627
SC42	-.002598	.016068	-8.427E-04	-.162	.8716
SC20	-.363598	.044067	-.117943	-8.251	.0000
YR76	-.039770	.004810	-.027097	-8.269	.0000
SC25	.003002	.011283	9.738E-04	.266	.7903
SC33	-.264587	.051069	-.085826	-5.181	.0000
SC17	-.018646	.013135	-.006048	-1.420	.1565
SC11	-.198522	.053125	-.064396	-3.737	.0002
YR83	-.029483	.004596	-.020088	-6.415	.0000
SC10	-.007052	.011233	-.002288	-.628	.5305
SC36	-.373274	.063422	-.121082	-5.886	.0000
SC32	.009098	.013050	.002951	.697	.4861
SC37	.005048	.015182	.001637	.332	.7397
YR81	-.020763	.004329	-.014147	-4.797	.0000
SC24	-.007013	.014575	-.002275	-.481	.6306
SC26	-5.15420E-04	.009262	-1.672E-04	-.056	.9556
SC41	-.156665	.066540	-.050819	-2.354	.0190
YR80	-.015267	.004474	-.010402	-3.413	.0007
SC7	.005706	.011427	.001851	.499	.6178
SC39	.007061	.011461	.002290	.616	.5382
YR78	-.021401	.004547	-.014581	-4.707	.0000
SC27	.009099	.015004	.002951	.606	.5445
SC30	-.706249	.084348	-.229091	-8.373	.0000
YR77	-.032881	.004804	-.022403	-6.844	.0000
SC43	.006089	.012553	.001975	.485	.6279
CONSCON	.125537	.071681	.008259	1.751	.0806
CORTXPY	.019023	.704154	1.713E-04	.027	.9785
RDCON	-.041135	.016042	-.029255	-2.564	.0107
PROCCON	.024633	.005432	.051186	4.534	.0000
SERVCON	.095643	.020452	.054249	4.676	.0000
MANWAGE	.011613	.010818	.014983	1.073	.2837
MILPAY	-.038066	.022226	-.028422	-1.713	.0875
SC4	-.568147	.133534	-.184294	-4.255	.0000

```
 STHEL          .061951     .014834     .105164     4.176   .0000
 CIVPAY        -.069219     .054188    -.042381    -1.277   .2022
 POPHAT         .107608     .005215    1.164582    20.636   .0000
 (CONSTANT)    -.040913     .044851                -.912   .3622
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
114 DEC 87   FINAL REGRESSION
30
 20:25:44    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP      VM/SP CMS
0                                  * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
0EQUATION NUMBER 4    DEPENDENT VARIABLE..   SEREMP   SERVICE EMPLOYMENT
0
 MULTIPLE R           .93888          ANALYSIS OF VARIANCE
 R SQUARE             .88150                          DF      SUM OF SQUARES      MEAN SQUARE
 ADJUSTED R SQUARE    .86223          REGRESSION      67          91.83345          1.37065
 STANDARD ERROR       .17310          RESIDUAL       412          12.34548           .02996

                                      F =       45.74204      SIGNIF F =  .0000

114 DEC 87   FINAL REGRESSION
33
 20:25:45    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP      VM/SP CMS
0                                  * * * *  M U L T I P L E   R E G R E S S I O N  * * * *
0EQUATION NUMBER 4    DEPENDENT VARIABLE..   SEREMP   SERVICE EMPLOYMENT
------------------- VARIABLES IN THE EQUATION ------------------
0VARIABLE              B         SE B        BETA         T   SIG T

 SC47          -.221078     .192904    -.067777    -1.146   .2524
 YR84          -.034375     .039317    -.022136     -.874   .3825
 STHEH         -.191756     .076736    -.572123    -2.499   .0128
 SC19          -.211782     .256742    -.064927     -.825   .4099
 SC18          -.332695     .276345    -.101996    -1.204   .2293
 SC16          -.318507     .164884    -.097647    -1.932   .0541
 SC1           -.392862     .205458    -.120442    -1.912   .0566
 SC12          -.286637     .211009    -.087876    -1.358   .1751
 SC21          -.050148     .165911    -.015374     -.302   .7626
 SC15          -.382633     .162792    -.117306    -2.350   .0192
 SC9           -.705234     .279896    -.216208    -2.520   .0121
 SC23          -.267963     .202224    -.082151    -1.325   .1859
 SC40          -.380645     .196029    -.116697    -1.942   .0528
 SC45          -.240004     .211579    -.073579    -1.134   .2573
 SC44          -.768237     .516988    -.235523    -1.486   .1380
 SC13          -.038275     .133661    -.011734     -.286   .7747
 SC28          -.534124     .318604    -.163750    -1.676   .0944
 SC34          -.314267     .172633    -.096347    -1.820   .0694
 YR79          -.011679     .038105    -.007520     -.306   .7594
 SC38          -.507772     .191506    -.155671    -2.651   .0083
 SC5           -.243835     .135553    -.074754    -1.799   .0728
 SC31          -.860658     .269131    -.263857    -3.198   .0015
 SC2           -.148411     .123034    -.045499    -1.206   .2284
 SC35          -.035043     .133343    -.010743     -.263   .7928
 SC22          -.320337     .159553    -.098208    -2.008   .0453
 SC6           -.121270     .143819    -.037178     -.843   .3996
 SC14          -.214233     .120717    -.065679    -1.775   .0767
 YR82           .051551     .037107     .033196     1.389   .1655
 SC46          -.033306     .099874    -.010211     -.333   .7389
 SC8           -.879492     .393315    -.269631    -2.236   .0259
 SC3           -.225988     .145469    -.069283    -1.554   .1211
 SC29          -.115428     .127003    -.035388     -.909   .3640
 SC42          -.018146     .138357    -.005563     -.131   .8957
 SC20          -.630763     .379449    -.193377    -1.662   .0972
 YR76          -.062008     .041415    -.039930    -1.497   .1351
 SC25          -.120469     .097151    -.036933    -1.240   .2157
 SC33          -.628884     .439740    -.192801    -1.430   .1534
 SC17          -.104366     .113099    -.031996     -.923   .3567
 SC11          -.887580     .457444    -.272111    -1.940   .0530
 YR83          -.052698     .039574    -.033935    -1.332   .1837
 SC10           .001098     .096725  3.368E-04      .011   .9909
 SC36          -.766348     .546109    -.234944    -1.403   .1613
 SC32          -.039129     .112367    -.011996     -.348   .7278
 SC37          -.068960     .130724    -.021141     -.528   .5981
 YR81          -.033147     .037272    -.021345     -.889   .3744
```

SC24	.065807	.125501	.020175	.524	.6003
SC26	.051925	.079749	.015919	.651	.5153
SC41	-1.459335	.572950	-.447397	-2.547	.0112
YR80	-.010890	.038523	-.007012	-.283	.7776
SC7	.051907	.098397	.015914	.528	.5981
SC39	-.070592	.098686	-.021642	-.715	.4748
YR78	-.050343	.039153	-.032418	-1.286	.1992
SC27	-.033783	.129190	-.010357	-.261	.7938
SC30	-1.372515	.726295	-.420780	-1.890	.0595
YR77	-.063924	.041370	-.041164	-1.545	.1231
SC43	.020329	.108088	.006232	.188	.8509
CONSCON	.539874	.617224	.033567	.875	.3823
CORTXPY	-3.780679	6.063232	-.032172	-.624	.5333
RDCON	-.242335	.138134	-.162890	-1.754	.0801
PROCCON	-.048581	.046776	-.095409	-1.039	.2996
SERVCON	.485767	.176105	.260410	2.758	.0061
MANWAGE	-.065101	.093153	-.079380	-.699	.4850
MILPAY	.718796	.191378	.507246	3.756	.0002
SC4	-2.638003	1.149813	-.808749	-2.294	.0223
STWEL	.333415	.127730	.534923	2.610	.0094
CIVPAY	-.089425	.466592	-.051747	-.192	.8481
POPHAT	.160552	.044902	1.642210	3.576	.0004
(CONSTANT)	.247704	.386200		.641	.5216

-END BLOCK NUMBER 1 ALL REQUESTED VARIABLES ENTERED.

APPENDIX H

REGRESSION EQUATION AND RESULTS USING PROCCON LAGGED

```
     1  0          RUN NAME       FINAL REGRESSION
     2  0          FILE HANDLE FINALDAT/NAME='BASDATFF DATA A'
     3  0          DATA LIST FILE=FINALDAT FREE/
     4  0
     5  0                              YEAR,STATE,PERSINC,POP,MILPAY,CIVPAY,
     6  0                            PROCCON,RDCON,SERVCON,CONSCON,MFGEMP,   FHEH,FWEL,
     7  0                            STHEH,STWEL,PERINCTX,CORINCTX,MANWAGE,
     8  0                            MANINC, CORPPINC,  LNDAREA,RETIREE,TOTEMP,WREMP,
     9  0                            SEREMP,POPLAG,TOTEMPLG,WREMPLG,SEREMPLG,MFGEMPLG,
    10  0                            YR76 TO YR84,SC1 TO SC47
    11  0          VAR LABELS        PERSINC 'PERSONAL INCOME'
    12  0                            MILPAY 'MILITARY PAYROLL'
    13  0                            CIVPAY 'CIVILIAN PAYROLL'
    14  0                            PROCCON 'PROCURMENT CONTRACTS'
    15  0                            RDCON 'R&D CONTRACTS'
    16  0                            SERVCON 'SERVICE CONTRACTS'
     17  0                             CONSCON 'CONSTRUCTION CONTRACTS'
     18  0                             STHEH 'STATE SPENDING (HIGH. EDUCAT. HEALTH)'
     19  0                             STWEL 'STATE SPENDING WELFARE'
     20  0                             PERINCTX 'PERSONAL INCOME TAX'
     21  0                             CORINCTX 'CORPORATE INCOME TAX'
     22  0                             MANWAGE 'AVERAGE MANUFACT. WAGE'
     23  0                             POP  'POPULATION'
     24  0                             TOTEMP 'TOTAL NON-AG EMPLOYMENT'
     25  0                             WREMP 'WHOLESALE-RETAIL TRADE EMP.'
     26  0                             SEREMP 'SERVICE EMPLOYMENT'
     27  0                             MFGEMP  'MANUFACTURING EMPLOYMENT'
     28  0                             FHEH 'FEDERAL SPENDING (HIGH. EDUCAT. HEALTH)'
     29  0                             FWEL 'FEDERAL WELFARE SPENDING'
     30  0                             RETIREE '% POP. OVER 65 YEARS'
     31  0                             POPLAG 'POPULATION LAGGED 1 YR.'
117 DEC 87   FINAL REGRESSION
2
  16:49:04    NAVAL POSTGRADUATE SCHOOL      IBM 3033AP       VM/SP CMS
     32  0          COMPUTE         PROCCONS = LAG(PROCCON,1)
     33  0          COMPUTE         PROCCONN = PROCCON*.6 + PROCCONS*.4
     34  0          COMPUTE         CORPINC = CORPPINC*1000
     35  0
     36  0          COMPUTE         DODTOTAL = MILPAY + CIVPAY + PROCCON + RDCON + SERVCON +
     37  0                                     CONSCON
     38  0          COMPUTE         CORTXPY = CORINCTX/CORPINC
     39  0          COMPUTE         INCTXPY = PERINCTX/PERSINC
     40  0          COMPUTE         POPDEN = POP/LNDAREA
     41  0          COMPUTE         PCSTHEH = STHEH/POP
     42  0          COMPUTE         PCSTWEL = STWEL/POP
     43  0          COMPUTE         AJSTHEH = STHEH-FHEH
     44  0          COMPUTE         AJSTWEL = STWEL-FWEL
     45  0          COMPUTE         DELTEMP =(TOTEMP-TOTEMPLG)/TOTEMPLG
     46  0          COMPUTE         PCPERINC = PERSINC/POP
     47  0          COMPUTE         PERSPAY = MILPAY + CIVPAY
     48  0          COMPUTE         DODCONS = CONSCON + PROCCON + SERVCON + RDCON
     49  0          VAR LABELS      DODTOTAL 'TOTAL DOD EXPENDITURES'
     50  0                          DODCONS 'TOTAL DOD CONTRACTS'
     51  0                          PERSPAY 'DOD MILITARY AND CIVILIAN PAYROLL'
     52  0                          INCTXPY 'PERSONAL INCOME TAX PROXY'
     53  0                          CORPINC 'CORPORATE INCOME'
     54  0                          CORTXPY 'CORPORATE INCOME TAX PROXY'
     55  0                          POPDEN 'POPULATION DENSITY'
     56  0                          PCPERINC 'PERCAPITA PERSONAL INCOME'
     57  0                          PCSTHEH 'PERCAPITA STATE SPENDING HEALTH,HIWAY,EDUC.'
     58  0                          PCSTWEL 'PERCAPITA STATE SPENDING WELFARE'
```

```
    59  0          REGRESSION VARIABLES=(COLLECT)/
    60  0                     CRITERIA=TOL(.0001)/
0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
-LISTWISE DELETION OF MISSING DATA
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP   POPULATION

0
  VARIABLE(S) ENTERED ON STEP NUMBER  1..    PCPERINC  PERCAPITA PERSONAL INCOME
                                             2..    DELTEMP
                                             3..    PCSTHEH   PERCAPITA STATE SPENDING HEALTH,HIWAY,ED
                                             4..    INCTXPY   PERSONAL INCOME TAX PROXY
                                             5..    POPLAG    POPULATION LAGGED 1 YR.
                                             6..    MANWAGE   AVERAGE MANUFACT. WAGE
                                             7..    POPDEN    POPULATION DENSITY
                                             8..    PCSTWEL   PERCAPITA STATE SPENDING WELFARE
0
  MULTIPLE R           .99988          ANALYSIS OF VARIANCE
  R SQUARE             .99976                              DF      SUM OF SQUARES      MEAN SQUARE
  ADJUSTED R SQUARE    .99975          REGRESSION           8         10899.52028       1362.44004
  STANDARD ERROR       .07474          RESIDUAL           471             2.63080          .00559

                                                          F =  243921.49422       SIGNIF F =  .0000
------------------- VARIABLES IN THE EQUATION ------------------
0VARIABLE              B         SE B        BETA          T  SIG T

  PCPERINC         .013504     .006449     .002048      2.094  .0368
  DELTEMP          .529516     .106543     .003695      4.970  .0000
  PCSTHEH          .206886     .063041     .002680      3.282  .0011
  INCTXPY        -1.174916     .372290    -.002612     -3.156  .0017
  POPLAG          1.016839  8.8786E-04    1.003906   1145.274  .0000
  MANWAGE         -.033113     .007356    -.003947     -4.502  .0000
  POPDEN          -.066552     .021037    -.003128     -3.164  .0017
  PCSTWEL         -.591638     .140352    -.004432     -4.215  .0000
  (CONSTANT)       .039910     .033944                 1.176  .2403
-END BLOCK NUMBER   1   ALL REQUESTED VARIABLES ENTERED.
117 DEC 87   FINAL REGRESSION
4
  16:49:22    NAVAL POSTGRADUATE SCHOOL       IBM 3033AP       VM/SP CMS

0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   POP   POPULATION

0RESIDUALS STATISTICS:

                              MIN           MAX      MEAN  STD DEV    N

  *PRED              .4569     26.1734    4.7106    4.7702  480
  *RESID           -.3753       .4667     .0000     .0741  480
  *ZPRED           -.8917      4.4994     .0000    1.0000  480
  *ZRESID         -5.0223      6.2444     .0000     .9916  480
0TOTAL CASES =       480
    66  0                     DEPENDENT= MFGEMP /ENTER
    67  0                     POPHAT PROCCONN SERVCON RDCON CONSCON MILPAY CIVPAY
    68  0                     STHEH STWEL  MANWAGE CORTXPY      YR76 TO YR84
    69  0                     SC1 TO SC47/
0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
-LISTWISE DELETION OF MISSING DATA
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   MFGEMP   MANUFACTURING EMPLOYMENT

117 DEC 87   FINAL REGRESSION
7
0
  MULTIPLE R           .99676          ANALYSIS OF VARIANCE
  R SQUARE             .99353                              DF      SUM OF SQUARES      MEAN SQUARE
  ADJUSTED R SQUARE    .99247          REGRESSION          67           85.94784          1.28280
  STANDARD ERROR       .03692          RESIDUAL           411             .56010          .00136

                                                          F =     941.31623       SIGNIF F =  .0000

117 DEC 87   FINAL REGRESSION
9
  16:49:35    NAVAL POSTGRADUATE SCHOOL       IBM 3033AP       VM/SP CMS

0                                  * * * *  M U L T I P L E  R E G R E S S I O N  * * * *
0EQUATION NUMBER 1    DEPENDENT VARIABLE..   MFGEMP   MANUFACTURING EMPLOYMENT
------------------- VARIABLES IN THE EQUATION ------------------
```

OVARIABLE	B	SE B	BETA	T	SIG T
SC47	.335989	.041030	.113036	8.189	.0000
YR84	.018948	.008339	.013388	2.272	.0236
STHEH	.102063	.016459	.334172	6.201	.0000
SC19	.549246	.054881	.184781	10.008	.0000
SC1	.183709	.044350	.058695	4.142	.0000
SC18	.088274	.059220	.029698	1.491	.1368
SC16	-.026142	.035110	-.008795	-.745	.4570
SC12	.379768	.045144	.127764	8.412	.0000
SC21	.159162	.035309	.053546	4.508	.0000
SC15	.076073	.034578	.025593	2.200	.0284
SC9	.278568	.059922	.093718	4.649	.0000
SC23	.259055	.043338	.087153	5.978	.0000
SC40	.320455	.041539	.107810	7.714	.0000
SC45	.061908	.044985	.020828	1.376	.1695
SC44	.208319	.110742	.070084	1.881	.0607
SC13	.070882	.028283	.023846	2.506	.0126
SC28	.491795	.068077	.165453	7.224	.0000
SC34	.041875	.036915	.014088	1.134	.2573
YR79	.060084	.008060	.042455	7.454	.0000
SC38	.235954	.040964	.079381	5.760	.0000
SC5	.035404	.028158	.011911	1.257	.2093
SC31	.463347	.056516	.155882	8.198	.0000
SC2	.003270	.026365	.001100	.124	.9014
SC35	.077757	.028379	.026160	2.740	.0064
SC22	.142457	.034238	.047926	4.161	.0000
SC6	.340295	.030044	.114484	11.327	.0000
SC14	.083465	.025882	.028080	3.225	.0014
YR82	.015031	.007901	.010621	1.903	.0578
SC46	.007811	.021159	.002628	.369	.7122
SC8	-.036396	.083368	-.012245	-.437	.6627
SC3	.141271	.031128	.047527	4.538	.0000
SC29	-.005007	.027120	-.001684	-.185	.8536
SC42	.050090	.029621	.016852	1.691	.0916
SC20	.624308	.080332	.210034	7.772	.0000
YR83	.010674	.008418	.007542	1.268	.2055
SC25	.035861	.020765	.012065	1.727	.0849
SC33	.734794	.093586	.247205	7.852	.0000
SC17	.113956	.024220	.038338	4.705	.0000
SC11	.613237	.096512	.206309	6.354	.0000
SC10	.023753	.020646	.007991	1.150	.2506
YR76	.018572	.008839	.013001	2.101	.0362
SC36	.813380	.116730	.273643	6.968	.0000
SC32	.010998	.024034	.003700	.458	.6475
SC37	.152569	.027942	.051328	5.460	.0000
YR81	.041368	.007939	.029230	5.211	.0000
SC24	-.015197	.026769	-.005113	-.568	.5705
SC26	-.007751	.017005	-.002608	-.456	.6488
SC41	.204333	.122486	.068743	1.668	.0960
YR80	.036642	.008158	.025891	4.492	.0000
SC7	.056415	.020976	.018980	2.689	.0074
SC39	.035942	.021083	.012092	1.705	.0890
YR78	.061293	.008343	.043309	7.346	.0000
SC27	.129938	.027592	.043715	4.709	.0000
SC30	.797249	.154263	.268216	5.168	.0000
YR77	.043124	.008794	.030471	4.904	.0000
SC43	.073383	.023076	.024688	3.180	.0016
CONSCON	-.035712	.131629	-.002436	-.271	.7863
CORTXPY	.017601	1.293804	1.643E-04	.014	.9892
PROCCONN	-.003835	.007044	-.007955	-.544	.5864
RDCON	-.068039	.028923	-.050183	-2.352	.0191
SERVCON	-.109642	.037530	-.064499	-2.921	.0037
MANWAGE	.031668	.019887	.042346	1.592	.1121
MILPAY	.101115	.040797	.078305	2.478	.0136
SC4	1.141417	.245776	.384003	4.644	.0000
STHEL	-.144394	.027292	-.254195	-5.291	.0000
CIVPAY	-.079406	.099134	-.050424	-.801	.4236
POPHAT	.036335	.009509	.407827	3.821	.0002
(CONSTANT)	-.191370	.082419		-2.322	.0207

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